

EXPOSITION UNIVERSELLE,

PARIS, 1868.

A W A R D E D :

1st—ONE (of the five) GRAND PRIZE.

DR. E. D. HUDSON.

“Material for the Relief of the wounded in the war of 1861.”

IN THE DEPARTMENT, UNITED STATES SANITARY COMMISSION.

The Highest Expression of the Imperial Commission.

2d—BRONZE MEDAL (exclusive cast) AND DIPLOMA.

DR. E. D. HUDSON.

FOR ARTIFICIAL LIMBS (Legs and Arms).

By the International Jury.

PARIS, 1867.

LE CONSEILLER D'ÉTAT,
Commissaire General,
F. LE PLAY.

LE MINISTRE,
Vice-Pres't de la Commission Imperiale,
CE. FORÉADE.

REPORT OF U. S. COMMISSIONER, T. W. EVANS, M. D., MEMBER OF
THE JURY OF THE UNIVERSAL EXPOSITION, TO THE UNITED
STATES. WILLIAM H. SEWARD, SECRETARY, DEPARTMENT OF
STATE. TO WIT:

“DR. HUDSON has received from the IMPERIAL COMMISSION a BRONZE MEDAL and DIPLOMA, for the Limbs sent by him, which have been particularly admired, and are in execution unquestionably the most remarkable in the Exposition.”

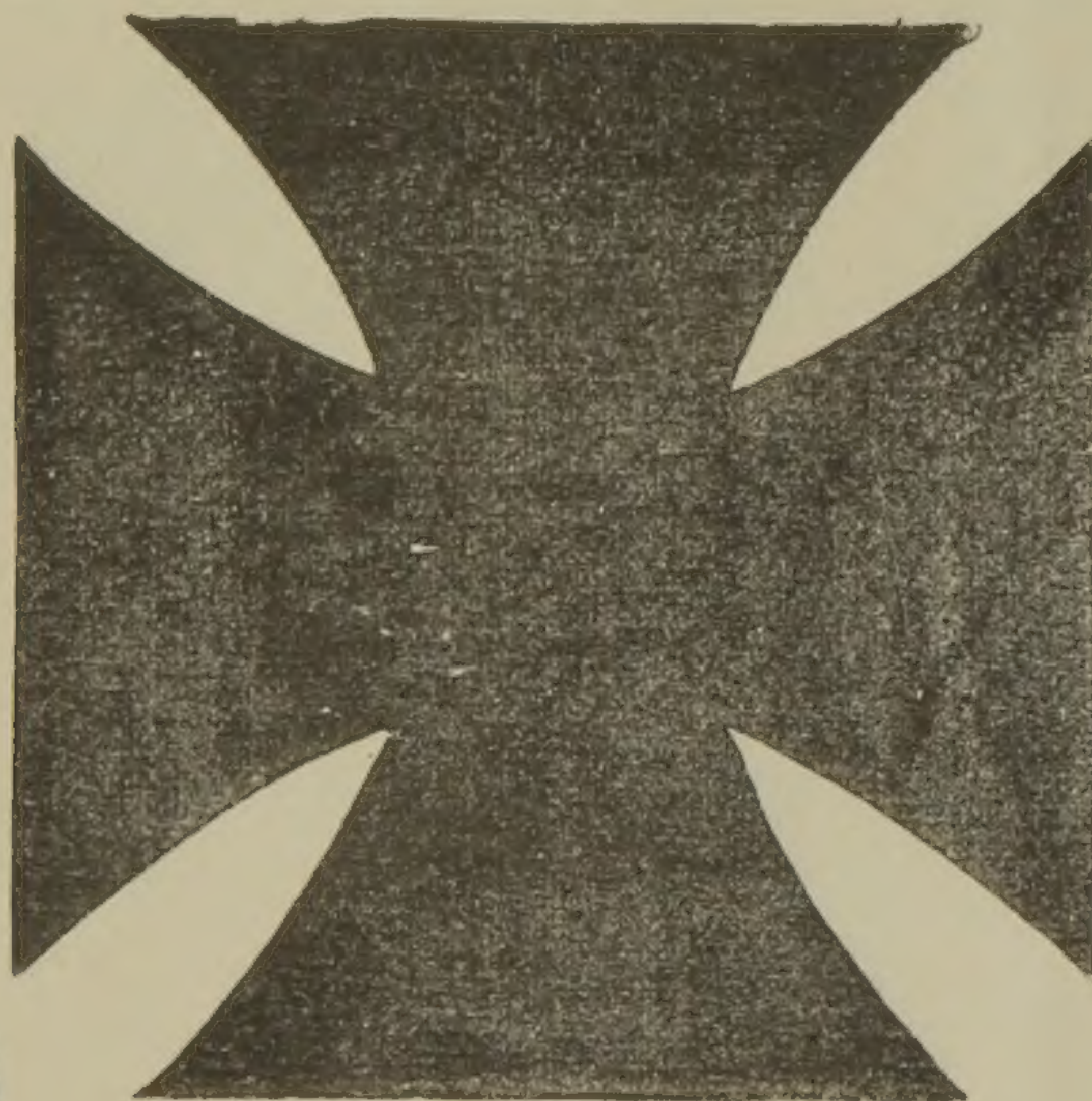
(The only Limbs which had the award of Medal.)

CONFERENCE
OF THE
International Sanitary Commission
AT THE
EXPOSITION UNIVERSELLE, PARIS, 1867.

The Material employed in the Sanitary Service of all Nations, for the relief of their Wounded Soldiers and Sailors, was fully represented.

The International Sanitary Commission as then composed of Representatives of the Royal Sanitary Commissions of PRUSSIA, FRANCE, AUSTRIA, RUSSIA, ITALY, SWITZERLAND, ENGLAND and UNITED STATES, held its Conference under the flag of the SOCIÉTÉ DE SECOURS AUX BLESSÉS MILITAIRES (or SOCIETY FOR THE RELIEF OF WOUNDED SOLDIERS AND SAILORS) OF FRANCE.

TESTIMONIAL OF THE CONFERENCE.



“IN THE NAME OF THE CONFERENCE OF ASSOCIATIONS FOR THE RELIEF OF WOUNDED SOLDIERS AND SAILORS,

“I have the honor to inform you that a MEDAL has been awarded to you, by the Assembly of Delegates at the Distinguished Seance of the 31st of August, 1867—for the services which you have rendered to the cause of Universal Humanity.

PARIS, September 8th, 1867.

COUNT SÉRUIÉR,

Commissioner General of the International Exposition,
President of the Conference.

COUNT G. de CHÂBOLY, }
T. GAUVÍY. } General Secretaries.

To Monsieur HUDSON.”

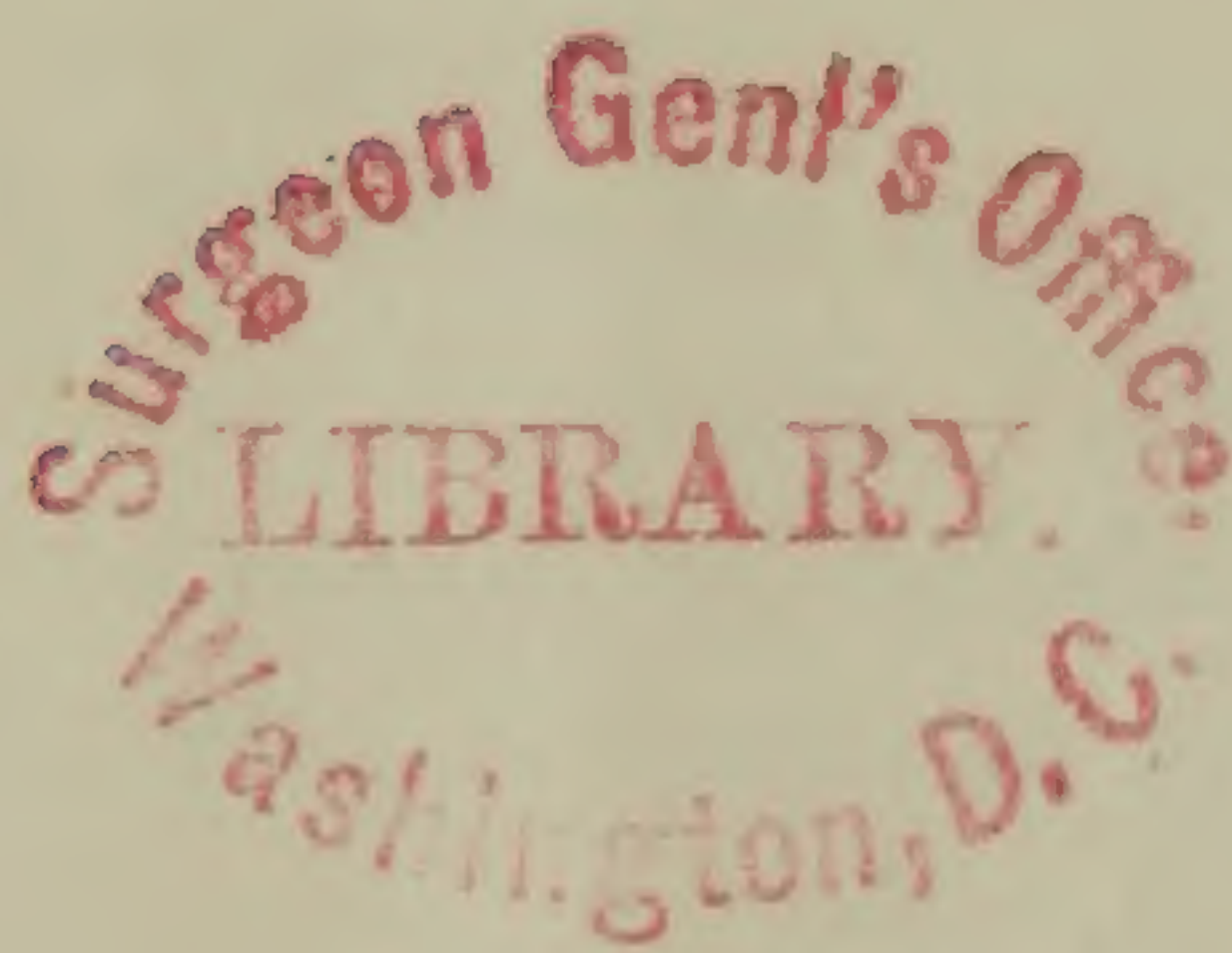
E. D. HUDSON, M. D., 696 BROADWAY, N. Y.

Specialty of Mechanical Surgery, and Artificial Legs and Arms.

no

MECHANICAL SURGERY.

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AT Win
E. D. HUDSON, M. D.



E. D. HUDSON, M. D.,

696 BROADWAY, CORNER FOURTH STREET.

NEW YORK.

1871.

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ARMED FORCES MEDICAL LIBRARY
WASHINGTON, D. C.

MECHANICAL SURGERY,

BY

E. D. HUDSON, M. D.

The claim of mechanical surgery as a specialty, and the necessity of bringing the devising and constructing of prothetic apparatus within the circle of professional pursuits, is becoming generally acknowledged.

As **a branch supplementary to operative surgery**, the construction of apparatus, whether palliative or remedial or as substitutes for lost parts, should be intrusted only to educated and experienced physicians familiar with the anatomy and physiology of the body, capable to recognize the nature of deformities and mutilations, and to perceive, in each case, the indications which are to be fulfilled by mechanism.

Mechanical skill alone is not adequate to the requirements of science in this direction. Especially is this true where apparatus is intended to supply or reinforce natural functions of members temporarily helpless, or useless from the presence of deformity or extensive injury.

As the most **conclusive evidence of this**, we may cite the several hundred cases of resection of the arm and forearm, together with the cases of resection of the hip and leg, and the many peculiar and unique cases of gunshot injury of the joints and nerves, which have been referred to us from the Surgeon General's office for apparatus during the past ten years. Of these cases it can truly be said that **no two were alike**, and **but few resembled** in the indications which restorative apparatus was to fulfill. In many of those cases the absolute value of professional supervision and scientific mechanism, has been demonstrated by a restoration of the injured parts to nearly normal usefulness. Thus, after the lapse of months or years, resections of a considerable extent have resulted in

the full use of the arm, and proven the economical value of the operation above amputation. Again we may refer to the **cases of paralysis** referred to us by Prof. W. A. Hammond, and to Prof. Sayre's cases of wrist drop from saturnine poisoning, to cases of congenital dislocation, to cases of **ununited fracture**, luxation of the pelvic articulations, to rupture of the conjoined tendon of the thigh and ligamentum patellae, and many others continually coming under our observation, as cases which, in their nature, of necessity demand a recognition of the pathological conditions which exist, and of the processes of repair which are going on or are anticipated, and to be sought for by the agency of apparatus—whether as a **means of support** or for **passive exercise**, or for **active exercise** and use.

The fact that the treatment of such cases, with prothetic and remedial apparatus, should be conducted by professional men, will, we think, be generally conceded.

But there are also **strong and conclusive reasons** why the application of artificial limbs to stumps, should also be entrusted only to the mechanical surgeon, establishing his claim upon the profession for their support of his efforts to **supplement their operations**.

It is essential to recognize, in each case, the mode of amputation, to judge of the degree of atrophy existing or yet to ensue, to observe the shape of stump, redundancy of flaps, prominent osseous angles and crests, the presence of periostitis or periosteal thickening, or of sensitive cicatrices or neuromata.

By such a knowledge of the part the artificial limb will be so adjusted as to take bearing only where the pressure may be uniformly distributed without pain, while the stump will be in no danger of periostitis or callosities, nor of ulceration. To diagnosticate existing caries or necrosis, or threatening osteo-myelitis, and withhold from it the irritation of apparatus is no less the duty and **province of the mechanical surgeon**, than by a judicious treatment of ulcerated, irritable and seemingly useless stumps, to restore them to a condition in which apparatus is safe and desirable.

When it is considered that most ill-conditioned **stumps are no longer under the eye of the surgeon** who operated, the patient often many miles removed, it will be seen that the mechanic, to whom he applies, should be competent to discriminate between the healthy and the unhealthy stump, and fit the stump, which the surgeon has transferred to his care, for the apparatus which is to be applied.

Finally, and most important **in a scientific point of view**, is the fact that the mechanical surgeon has the widest field, and almost the only opportunity offered to the profession, of comparing the ultimate conditions of resections and of stumps resultant from every form of amputation, by various operators in all parts of the country, and thus to collect statistics as to their comparative success, and the relative desirability of various operations.

In rare cases of resection, amputations and other injuries among soldiers, detailed reports and histories together with photographic illustrations, have been transmitted to the Surgeon General, and have received special acknowledgment, from time to time, as valuable contributions to the surgical literature of the war, and the matériel of the Army Medical Museum.

And the **important reports in progress**, under the direction and auspices of the Sanitary Commission upon "Amputation," "Resection" and especially "Syme's Amputation," have been based mainly upon our histories and data accumulated by careful study, and record of all our cases during the war.

EXTRACT.

(**From an article** by PROF. STEPHEN SMITH, M. D., *Surgeon to Bellevue Hospital, etc.*, 1871.)

"It is surprising that surgeons take so little interest in the progress of Mechanical Surgery and are so ignorant of the present state of that art, since it is so intimately associated with their daily practice. Its claim upon our consideration, and its right to be represented in our counsel cannot much longer be ignored. It has fairly **divested amputations** of the lower extremity of their former **terrible aspect** by substituting an artificial limb as perfect in appearance and nearly as serviceable as that removed. The **intimate relations of Operative and Mechanical Surgery** should at once be recognized and in determining the place of election, the Mechanical Surgeon should give us the results of his observation and experience. It is by no means an uncommon occurrence to meet with stumps which plainly show that the surgeon elected the point of operation, with a view to the rude appliances of three centuries ago, when surgery was in the hands of barbers."

EXPRESSIONS OF THE PROFESSION.

THE LATE DR. VALENTINE MOTT,

Emeritus Professor of Surgery, New York University Surgeon to Bellevue and St. Vincent's Hospitals.

No. 1 GRAMERCY PARK, N. Y., March 26, 1862.

Dear Sir: I am gratified to find that you are giving your attention to what may properly be called Mechanical Surgery. As a regularly educated professional man you can repair the mutilation which surgery has to make much more effectually than the mere mechanic. It will give me pleasure to take advantage of your skill in the arrangement of surgical appliance.

Yours, truly,

To Dr. HUDSON.

VALENTINE MOTT, M. D.

WILLARD PARKER, M. D.,

Prof. Clinical Surgery College of Physicians & Surgeons, N. Y., Surgeon to New York Hospital.

I have known E. D. HUDSON, M. D., in the manufacture and application of artificial limbs, many years. Many of my patients have had the advantage of his skill, and he has given unfailing satisfaction. I believe him fully entitled to the confidence of the profession and the public.

WILLARD PARKER, M. D.,

No. 41 E. 12th Street, N. Y.

DR. J. M. CARNOCHAN,

Surgeon in Chief, State Emigrants Hospital, Port Physician, N. Y.

Dear Sir: I am much gratified to learn that you devote your attention to the mechanical part of Surgery, which has for its aim the substitution and perfection of artificial limbs, to take the place of those on which disease has made the severe operation of removal necessary. Your education as a physician and surgeon enables you to carry out the indications which the peculiarities of individual cases must present, and thus the profession, and patients who have been so unfortunate as to have required amputation, will have the advantage of your mechanical ingenuity, as well as of your scientific acquirements.

The perfection to which the artificial limbs you are now engaged in manufacturing have been brought, and their recognized utility, place them among the valuable additions which intelligence and civilization have, in recent times, supplied for the amelioration and benefit of humanity. The professional community will undoubtedly avail themselves of your capabilities in your special vocation, as I shall assuredly do when occasion requires.

Very truly yours,

J. M. CARNOCHAN, M. D.,

Dr. E. D. HUDSON.

No. 14 E. 16th Street, N. Y.

GURDON BUCK, M. D.,

Surgeon to New York and St. Luke's Hospitals.

From personal knowledge of Dr. E. D. Hudson's skill and success in the adaptation of artificial substitutes for amputated limbs, I take pleasure in re-

commending him to the patronage of the profession, and of all who stand in need of his services. The high esteem enjoyed by Dr. H. hitherto in his professional relations, as well as his skill and experience acquired in the special department to which he devotes himself, entitle him to confidence and respect.

GURDON BUCK, M. D.,

No. 46 W. 29th Street, N. Y.

WM. H. VAN BUREN, M. D.,

Professor of Principles of Surgery, Bellevue Hospital Medical College.

DR. E. D. HUDSON.

My Dear Sir: I am gratified to know that you have formally adopted, as a speciality, the replacing of mutilated limbs, etc., by mechanical appliances. By bringing this duty to humanity properly within the pale of your profession, a step is gained in advance. It will give me pleasure to avail myself of your advice and assistance when occasion offers. Your entire success with the two cases of Syme's amputation at the ankle-joint was equally gratifying to my patients and to myself.

Most truly yours,

WILLIAM H. VAN BUREN, M. D.

No. 104 Madison Ave., N. Y.

I cordially indorse the sentiments of Dr. Van Buren.

JAMES R. WOOD, M. D.

*Surg. to Bellevue Hosp. and Prof. of Surgery,
Bellevue Hosp. Medical College.*

T. M. MARKOE, M. D.,

*Professor of Surgery College of Physicians and Surgeons, Surgeon to New York and
Bellevue Hospitals.*

I have now for many years employed Dr. E. D. Hudson's artificial limbs, and have had every reason to be well satisfied with their performance. In amputations at the knee and ankle-joint his appliances are admirable, and I know of no superior artificial limb to that which he adapts to stumps made in the continuity of the leg.

T. M. MARKOE, M. D.

No. 20 W. 30th Street, N. Y.

J. W. S. GOULEY, M. D.,

*Professor of Clinical Surgery University of New York, Surgeon to Bellevue,
Charity and St. Vincent's Hospitals.*

DR. E. D. HUDSON.

My Dear Sir: I take pleasure in adding to the many expressions of approval which you have already received from the profession. But I wish here to make particular mention of your specialty in the adaptation of an apparatus to supplant the clumsy shoe worn by patients who have suffered amputation at the ankle-joint, whether after the method of Syme or Pirigoff. From time to time I see the soldier on whom Pirigoff's operation was performed in the field, and who still wears your apparatus much to his satisfaction. The cases of Syme's operation are also much gratified with their new feet, and walk without a halt.

I have also examined, with no little interest, your apparatus for the excision of the elbow-joint; I consider its introduction calculated to encourage surgeons in their efforts at conservative surgery of the upper extremities.

In conclusion, permit me to express my satisfaction at the interest and kindness you have manifested in the patients sent you from the Central Park U. S. Hospital, during the period of my administration of that institution. Hoping you will continue as untiring in your well-directed efforts in Mechanical Surgery, and wishing every success,

I am, sir, very respectfully,

Your obedient servant,

J. W. S. GOULEY, M. D.,

No. 52 W. 24th Street, N. Y.

FRANK H. HAMILTON, M. D.,

Professor of Practice of Surgery, Bellevue Hospital Medical College, Surgeon to Bellevue and Charity Hospitals.

I have been long acquainted with Dr. Hudson, and have for many years recommended my patients to him for artificial limbs. While in charge of the U. S. General Hospital in Central Park, organized for the reception of soldiers requiring artificial limbs, my opportunities for judging of his skill were unusual.

I do not hesitate to recommend all of his work; but I desire to call especial attention to his very ingenious mechanism for the support of limbs on which resections have been practiced.

FRANK H. HAMILTON, M. D.,

No. 43 W. 32d Street, N. Y.

STEPHEN SMITH, M. D.

Professor of Anatomy Bellevue Hospital Medical College, Surgeon to Bellevue and Charity Hospitals.

DR. E. D. HUDSON.

Dear Sir: It gives me great pleasure to certify to the practical utility of the artificial limbs which you have applied to patients under my observation. Your appliance to stumps in amputations at the ankle-joint, by Syme's method, has, in my experience, been the perfection of usefulness. In the case of Kate Riley nothing could have been more satisfactory; not only could she walk without embarrassment, but no imperfection in her gait was perceptible. She performed her duties as nurse in Bellevue Hospital for several years, running up and down stairs, walking great distances, without her peculiar disability becoming known, either to her associates or to the Resident Medical Staff.

While connected with the U. S. General Hospital at Central Park, I had abundant opportunities to study the results of the application of artificial limbs, and the uniform satisfaction which your appliances gave impressed me with their practical value.

Yours, truly,

STEPHEN SMITH, M. D.,

No. 29 W. 42d Street, N. Y.

NEW YORK, Aug. 24, 1865.

DR. E. D. HUDSON.

Dear Sir: During two and a half years' service at U. S. A. General Hospital, Central Park, New York, I have very frequently examined the different mechanical appliances which you have furnished to the mutilated soldiers, and have been most favorably impressed with the skill, judgment and care with which they have been arranged; but I would especially mention the excellency of your artificial foot for amputations at the ankle-joint, and your apparatus for resections of the elbow and shoulder-joints, also that for exsection in continuity of the humerus. I feel fully satisfied that by your ingenious mechanical treatment of resections of the upper extremities many limbs have been made exceedingly serviceable which otherwise would have remained comparatively useless; and that no artificial arms can perform the functions which these limbs do with the assistance of such apparatus.

Very respectfully yours,

S. TEATS,

Late A. A. Surgeon U. S. A.

UNITED STATES ARMY AND NAVY.

(*Letter from MAJOR-GENERAL BARNES, Surgeon General, U. S. A., introducing Gov. Jenkins of Ga.*)

SURGEON GENERAL'S OFFICE,
Washington City, Feb. 15, 1868. }

DR. E. D. HUDSON.

Sir: I have advised Gov. Jenkins to see you in relation to procuring an auxiliary apparatus for his injured ankle. The contrivance he now wears is too heavy and bulky, and I have promised him that you will be able to furnish a much more useful and comfortable one, which will not only support the ankle but give a better and more uniform bearing for the foot.

Please give your personal attention to this,

And oblige, yours, &c.,

J. K. BARNES.

(*From DR. R. S. SATTERLEE, Brig.-Gen. U. S. A., Medical Purveyor, etc.*)

I have been for several years conversant with Dr. E. D. Hudson's efforts in the cause of conservative surgery, and have seen his appliances for the benefit of not only those who have suffered the loss of legs and arms, but especially his apparatus for operations at the ankle after the manner of Professor Syme, and in restoring action in resection of joints; and I think the Medical Profession and the public are under great obligations for his perseverance, and the degree of perfection to which he has brought his substitutes for nature in those cases. It gives me great pleasure to make this statement.

R. S. SATTERLEE, M. D.,

Brig.-Gen. and Medical Purveyor U. S. A.

MEDICAL PURVEYOR'S OFFICE, }
New York, Aug. 24th, 1865. }

OFFICE OF THE CHIEF MEDICAL OFFICER, }
New York, January 28, 1867. }

While Medical Director of the Department of the East, I was in constant business relation with Dr. E. D. Hudson, Manufacturer of Artificial Limbs and of Mechanical Appliances, etc., for resections.

In my whole intercourse then and since I was well satisfied with his entire ability and anxiety to do justice to the soldier and the Government.

Being a medical man, he united professional skill with mechanical knowledge and gave great satisfaction. His mechanical appliances for resection were a specialty, and proved remarkably successful.

WM. J. SLOAN, *Surgeon U. S. Army,*
Brig.-General, Chief Med. Officer, N. Y. City.

MEDICAL PURVEYOR'S OFFICE, }
Philadelphia, Jan. 29, 1867. }

While on duty as Medical Director Department of the East, at New York City, for about two and a half years, I gave many orders for artificial limbs and mechanical appliances upon Dr. E. D. Hudson. It was my practice always to examine personally the limbs and appliances before they were accepted, and I can therefore testify intelligently to the honesty and faithfulness with which the orders were filled. The artificial limbs and apparatus for resections supplied by Dr. Hudson gave entire satisfaction, and I heartily concur in the opinion given by Gen. Sloan.

C. McDOUGALL,
Brig.-Gen. U. S. Army, Medical Purveyor.

U. S. NAVAL HOSPITAL, N. Y., }
Brooklyn, Aug. 25, 1865. }

Dear Sir: I have been much gratified with the result of your treatment of the numerous cases of mutilation sent you from this hospital.

Your professional knowledge, with your mechanical skill, has enabled you to furnish the most perfect relief to each particular case; and the results must have been exceedingly gratifying to the recipients.

I can, therefore, fully recommend you to all those who may have the misfortune to lose the use of their limbs by exsection or amputation, for the mitigation of their afflictions, as far as human means can.

Very respectfully,

Your obedient servant,

THOS. L. SMITH,
Surgeon U. S. N., in charge of Naval Hospital.

To E. D. HUDSON, M. D., *New York.*

UNIVERSAL EXPOSITION.

PARIS, 1867.

Dr. HUDSON's Limbs and Apparatus were the only ones represented (by selection), from the United States,

IN THE

"Material for the Relief of the Wounded in the War of 1861,"

In the Department of the International Sanitary Commission,

AND SHARED IN THE AWARD OF THE

GRAND PRIZE AND GOLD MEDAL.

They also received a special award of a BRONZE MEDAL and DIPLOMA,

By the International Jury.

PARIS, 1867.

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Commissaire Général,
F. LE PLAY.

LE MINISTRE,
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T. GAUVIY, }
To Monsieur HUDSON.”

AMERICAN INSTITUTE.

LECTURE BY PROF. FRANK H. HAMILTON, M. D.

“THE TRIUMPHS OF AMERICAN SURGERY.”

Delivered at Academy of Music, New York, 1871.

(Extracted from proceedings of the American Institute.)

“I should do injustice to those who have contributed so much to **the perfection of surgery** by their **ingenious mechanical contrivances**, if I did not make special mention of them in this connection. To them we are constantly indebted for many original suggestions, and for the execution of our own plans of surgical apparatus and instruments. **Artificial limbs**, for those who have suffered amputation, and **mechanical supports** for limbs which have been resected, have attained in their hands a wonderful degree of perfection and adaptability for the purposes intended; and in some cases seem to leave nothing to be desired but sensation to render them equal to the animate originals, for which they have become the substitutes. Look, for example, at these artificial legs, arms and hands; and notice the curious and admirable construction of these supports for resected limbs, which have been sent to me, at my request, by Dr. Hudson, of this city, whom I regard as one of the most **expert** and ingenious artificial limb makers of the world.”

REPRESENTATIVE CASES.

ILLUSTRATIVE OF THE VALUE OF ANKLE-JOINT AMPUTATIONS, AND THEIR
COMPENSATION WITH APPARATUS.

CASE I.—J. E. A., Private Co. E., 8th N. Y. Cavalry. Wounded in the foot, comminuting the tarsus, July, 1863. Amputation of the ankle-joint—(Syme's method)—same day of injury, on the field. Oct. 18, 1863, transferred to Central Park U. S. General Hospital. Stump much swollen; tissues thickened, ulcerated, with indications of incipient necrosis. Appearances unfavorable. By good treatment the stump became healthy, though damaged some by abscesses. In January, 1864, I furnished apparatus. The incipient use was satisfactory. Soon after he returned to the army, associated with a sutler. He is now, (1871) engaged as a clerk in the War Department, and informs me that in every appearance—standing, locomotion, dancing—he passes for a whole man; can walk all day and feel no inconvenience: “**I can only say I have two good legs.**”

CASE II.—P. C., Private 7th Mich. Vols. Suffered amputation of his ankle-joint. In October, 1866, I furnished him a foot. Incipient use very creditable, with entire weight on the end of his stump. At first trial he experienced slight prickling, a temporary sensation. Nov. 11th, 1866, day after he returned home, he walked three miles with comfort; sensations all normal. The more he uses his foot, the more he feels every way whole and competent for his farming.

CASE III.—W. D., Private 6th Wisconsin Vols. Suffered amputation of the ankle-joint, (Syme's,) modified by dorsal flap. Apparatus, adapted to Plaster Paris cast of stump, and sent by express; was applied 1st November, 1866. In December, after thirty days' use, he wrote: "The adaptation was perfect. I applied the foot—got up and walked with perfect ease and naturalness. I have traveled five miles continuously with it and experienced no fatigue. I am light-house keeper, and find it of inestimable value in going up and down stairs, of which I have much to do."

LEG AMPUTATIONS

are the most common, and their compensation is uniformly successful and pleasing for an amputation of the lower third of the leg:

Mr. P., civil engineer, has been in use of the artificial leg I furnished him twenty years ago; is in active duty, surveying out routes for railroads; traveling over hills and valleys; climbing precipices, and performing the various fatiguing duties of his profession. He never uses a cane. Residence, New Jersey.

Mr. M., late soldier (Jefferson Co.) N. Y. Volunteers, lost his leg in the war. He is furnished an artificial leg by the Government. Has returned to his farm, is on his feet same as other farmers, from morning till night, in summer and winter. He stands in his lot apparently well, and ordinarily uses no cane.

LEG AMPUTATIONS OF THE UPPER THIRD.—The following cases illustrate the value of the **knee support** when the stump is flexed upon the thigh at a right angle, in conjunction with an apposite artificial leg, viz.:

H. K. D., *Farmer*, N. Y., lost his limb in the United States service; informs me that he with his brother did all of the work on a dairy farm of 180 acres (except ten days of hired labor), milked fifteen cows, plowed, hoed, raked, and pitched hay, same as when he was whole; and in the winter loaded in the woods heavy logs, alone rolling them up, and drawing them to the saw-mill. He had worn the leg three years.

M. Moses, *Carpenter*, Wisconsin, lost his leg at its upper third, in the United States service, and uses a **knee supporting** artificial leg. He informs me that he works at his trade, as formerly, and frequently walks six and eight miles to his place of work, and lifts as heavily as ever upon his limbs, upon which he is standing or walking much of his time. He had used his artificial leg three years without repair.

Miss. T., suffered an amputation of her leg, near the head of the tibia, in 1859, for a complete ankylosis of the knee-joint. She writes: "I walk and work upon the limb you furnished me as I never expected to again. I am very happy in my new life. Use no cane, and walk as my companions do."

OF KNEE-JOINT AMPUTATIONS,

thirty or more consecutive cases for which I have applied artificial limbs, the success has been invariably useful and pleasing. M. Conroy, who suffered amputation of his knee-joint sixteen years ago, writes that he had

used the artificial limb I furnished and adapted to the condyles of his stump ever since, and at continual hard work, with great command.

SINGLE THIGH AMPUTATIONS.

C. L., 2d Lieut. Vet. Res. Corps, promoted from private, after the artificial limb was applied; stump very bad, caused by extensive and almost fatal gangrene—says: “I have been on constant duty in Tennessee since April, 1864, one month after the artificial limb you furnished me was applied. I have walked long distances, have been able to ride horseback nearly, if not quite, as well as ever I could. The leg has more than given satisfaction. The leg is to-day as good as ever.”

Lieut. Neidhart says: “I am navigating with this walking machine of yours excellently well, and write you to-day only to express my gratification and thanks.” Oct. 25, '66.

H. C. D'W., First Sergt. U. S. Vet. Reserve Corps, writes that he walks nearly four miles within an hour. Since his limb was furnished has been in active U. S. service, and promoted from a private to first sergeant for his services. Has been using his limb since.

DOUBLE THIGH AMPUTATIONS.

C. N. L., late Co. K, 1st Vermont Cavalry. **One thigh amputated, and one knee-joint amputated**, July —, 1863. Writes: “I am doing finely with the pair of artificial legs, and the aid of canes. I keep improving. I find no difficulty in getting off or on railway cars, and steamboats; and in getting about quite independently. I suffer no irritation of my stumps; and after my experience, and comparing limbs with every other kind, I am satisfied with my selection.

BOTH THIGHS AMPUTATED.

C. G. R., at St. Luke's Hospital, wounded in battle at Petersburg, 1865. February 22d, '66, writes to me that he can use his legs very well with the use of canes; get up and down stairs with a cane and railing; walk out of doors; and regards the limbs of great benefit for walking or sitting. To which Rev. Dr. Muhlenburgh, Pastor and Superintendent, appended that “the above statement was correct, that Dr. Hudson had done more for Mr. R. than he believed possible.”

Mr. J. S. SANFORD lost his legs in 1851, and was furnished a pair of artificial limbs by me; **one for the thigh**, with an artificial knee-joint, and **one for the leg** amputation, which he is now using, 1871. He never uses but one cane, and about his ordinary business not any. He is on his limbs most of the time as freight agent, and in other active duties. He goes up and down stairs with great facility, and is considered one of the most valuable of the men in the employ of the N. J. Central Railroad Co.



SANFORD'S CASE.—FIG. I.

ARTIFICIAL LIMBS.

The **artificial limbs**, adapted and applied by myself, **personate** all of the essential **anatomical formations** and physiological **functions** of the natural leg. The general configuration and formation of knee, ankle and toe-joints are retained. The tendons of the foot, leg and thigh secure **elasticity**, **naturalness of dress, and action** and usefulness for flexion and extension, for walking, standing, sitting, or riding.

By them, all amputated limbs are compensable to a useful extent; in very many instances so completely as to render the loss relatively trifling and to challenge detection. Ankle-joint amputations are seldom recognizable, so appropriate is the mechanical treatment and perfect the restoration. Of the leg and knee-joint amputations a lesser but very great restoration is secured. The extreme loss of the thigh in continuity and even in contiguity of the great trochanter (as in the cases of the survivors of disarticulation at the hip-joint consigned to my special care by the Surgeon General U. S. A.), is remediable to a very useful extent, depending largely upon the intellectual and acrobatic powers of the patient.

ADAPTATION OF ARTIFICIAL LIMBS.

The adaptation of artificial legs by adjustable and **thickly padded sockets**, inserted into wooden, metallic or rawhide sockets, is always prejudicial, by the heat thus generated, and **debilitating** effect upon the stumps. Profuse perspiration is induced, and the fomenting process produces a softened, parboiled state of the skin and cicatrix, induces a debility that often opens the cicatrix and results in indolent ulcers.

The **sockets** for stumps **should always be solid**. They should be **carefully fitted** to the angles, protuberances and crests, and every irregular shape and condition of the stump, by the nicest adaptation. Their lining should be, generally, only one thickness of fine soft flannel—a material less calculated to irritate the skin than any other fabric. The **socket** should be **well ventilated**.

The utility and satisfaction afforded by an artificial limb will depend much upon the anatomical and physiological principles which govern its construction and skillful adaptation. An artificial leg that is constructed without **naturally constituted ankle and toe-joints, extensor and flexor tendons** of the foot and toes, is radically and essentially defective.

ANKLE-JOINT MOTION.

The Tibio-Astragaloid ankle-joint, which I originated several years ago, is the closest possible imitation of the ginglymoid or **hinge-joint** of nature, in its exact formation and action. Its opposing articular surfaces are composed:—the inferior of a surface of brass over the astragalus or foot part; the superior of thick lubricated leather over the concave articular surface of the Tibia or leg part.

These opposing surfaces are not subject to corrosion, **impediment of motion**, or noise. The foot has the same elasticity, life-like action, and **adaptation** to irregular surface as the natural foot, (which never accommodates a grade or obstacle). **rotary** and semi-rotary **motions** pertain exclusively, in principle and action, to the head of the **femur**, mediotarsal, and metatarso-digital joints of the inferior extremity.

The ankle-joint is purely a **hinge one**—as a **careful and critical dissection** will demonstrate—and every lateral motion which is introduced into the ankle-joint of an artificial leg is a violation of anatomical and physiological principles. The text books of all anatomists and physiologists, which are received authorities, bear witness to the correctness of the above premise, viz. :—

PHYSIOLOGICAL ANATOMY OF THE ANKLE-JOINT.

BONES OF THE FOOT AND ANKLE-JOINT.



a and *b*, Inferior Extremity of the Tibia and Fibula; *c*, Astragalus; *d*, Os Calcis; *e*, Scaphoid; *f*, Cuboid; *g*, Internal Cuneiform; *h*, Middle Cuneiform; *i*, External Cuneiform; 1, 2, 3, 4, and 5, First, Second, Third, Fourth, and Fifth Metatarsal Bones; *k, k, k, k, k*, Phalanges of the Toes; *, Ginglymus joint of the ankle.

“The **form of the Astragalus** is that of a pulley which, of course, admits of but **one direct motion**, viz.: forwards and backwards. Its sides are plain, smooth, and flat, and closely locked in by the inner and outer ankle, so as to prevent luxation or awkward motions to either side.

“The two points (malleoli), projecting so as to enclose the bones of the foot, making a pure hinge, **prevent all lateral motion**; make the joint firm and will not allow of luxation, till one or both ankles be broken.” (BELL.)

“The movements of the ankle-joint are limited to flexion and extension. There is **no lateral motion**.” (HENRY GRAY.)

“The articulation of the ankle is a ginglymus or **hinge-joint**. It is effectually secured from **lateral** dislocation by the projection of the malleoli, which descend, one on each side of the Astragalus, forming a sort of box for its reception, &c.” (MR. WARD on *Human Osteology*.)

FIG. No. 2.

ARTIFICIAL KNEE-JOINT.

The condyloid knee-joint which I some time since devised for knee and thigh amputations constitutes a new and essential adjunct to an artificial leg, particularly for those cases of amputations at the extreme upper third of the leg, which require a knee-supporting leg, and **a knee-joint with thigh and leg parts of the natural length.** The same is applicable for thigh stumps, when of extra length, the amputation being in immediate proximity to the condyloid enlargement. The trunnion-joints used for such cases are so arranged as to leave the interior and lower part of the thigh socket, and the supporting parts of the knee-bearing leg free of all interference with the end of the stump or the knee-supporting basis.

AMPUTATION OF THE INFERIOR EXTREMITIES.

RADICAL PRINCIPLES.

“You shall cut off as little of that which is sound as you possibly can ; and so that the patient may **most fitly use** the rest of his leg, by walking on an artificial leg.”—*Paré*.

The above axiom was enjoined three hundred years ago. Yet it is not unfrequent, even now, that this principle of conservatism is violated and the subsequent usefulness of the patient is inexcusably and culpably disregarded, particularly on the persons of the poor !

CASE.—I have a patient at this time, with amputation of the shaft of the femur. The extent of disease was not such as to have required a removal of its condyles, which, had they been preserved, would have rendered great service to him, in a knee-joint amputation, he being a poor laboring man.

It is an important fact to be considered that those who are poor now may become rich, and *vice versa*.

ANOTHER CASE.—A lady, now well to do by the avails of her own efforts, suffered an amputation of her leg at its upper third, when she was both young and poor, and regarded a proper candidate for a “peg leg.” The sound parts admitted of amputation at the lower third. Such an operation, with corresponding appliance would have rendered her loss comparatively trifling. The favor with which her surgeon is regarded will be seen intuitively. This case is no exceptional one.

MODES OF OPERATION AND THEIR RESULTS.

Very diverse views exist as to the best modes of amputating to secure the most useful stumps. The great variety of operations performed during the war, and in civil practice, presented to my obser-

vation for final treatment, indicate an undetermined general rule, and lack of uniformity of procedure when conditions and opportunities were equally favorable.

The **most creditable and serviceable stump**, viewed in its every feature, has been the product of the **bilateral tegumentary flaps, and circular incision of the muscles**. A strongly formed and scarcely perceptible cicatrix is effected by more or less of primary healing. It secures a smooth, round, and finely-composed end; and generally there is an equal retraction of the muscles. Its healthy tone and symmetrical proportions, render it an admirable work of nature and art. In no instance, when sloughing and other unfavorable events have not occurred, has the final result of this method been otherwise than gratifying. The results of the circular and bilateral varieties singly have been eminently superior to those of any other, excepting their compound. Agreeably to my personal observation, the **bilateral operation is the most favorable to a primary union**, in general or in part. I judge it to be favorable, also, to speedy secondary union, by the **drainage** it affords and escape of sanguineous and purulent matter. It will eventually be adopted in all amputations of the leg and thigh in the continuities, and of the knee-joint, as a uniform rule.

PLACES OF OPERATION.

No operation in surgery is possessed of greater interest, or practical importance, than an amputation of the inferior extremity; and yet no other part of the human system is subject to so much bad surgery.

In cases where conditions have been equal, and surgeons were favored with the choice of site for the greatest good of their subjects, their operations have borne witness that no rule of economy governed their choice.

Mr. Fergusson has styled much of surgery *a fashion*; to operate at one period just above the malleoli; at another, near the tuberosity of the tibia; and at other times, at all of the intermediate places, regardless of the good or evil results to the patients.

Such factitious practice must be the result of erroneous views entertained respecting the manner of compensating the loss of limb with apparatus.

THE FIRST PLACE OF ELECTION

is the **ankle-joint**—a place that, the surgeon having the choice of site, should never be disregarded.

ANKLE-JOINT AMPUTATIONS.

No amputation of the inferior extremity can ever **compare**, in its **value** to the subject, with that of the **ankle-joint** (originated by Mr. Syme.) Twelve years of experience with that variety of operation have afforded me assurance that it is “a fact complete,” not capable of being improved in its general character. It is **scientific**, practically of the utmost use, and conducive to the best interests of the patient.

Mr. Fergusson avowed that he “knew of no kind or style of amputation which deserved more high considerations ; and so far as the subject is concerned, it is one of the **greatest improvements** in modern surgery.” The subjects of such an amputation, with apparatus, scarcely realize their loss. They feel and appear every way whole. The sensations are normal ; the articular surface and thickened tissues become accustomed to the hardest service. The patient is enabled to engage in his accustomed vocations with naturalness and endurance. One subject has walked thirty-five miles in a day, on a hunting excursion, while his companions did not suspect that he was otherwise than whole. So beneficent have been the results of this operation as to have induced many sufferers from congenital malformations, varieties of talipes, and troublesome Chopart operations, to demand it as an “amputation of convenience.”

It is an operation that has for its support the soundest principle of surgical economy.

It retains, in addition to the entire length of leg, nature’s foundation—the **articular portion** of the shaft of a long bone—as a base of support.

Its accustomed service is concurrent and co-equal with that of the calcaneum, to sustain the weight and forces of the body which are reflected to it.

Therefore to remove the calcaneum, and to substitute the articular **base of the tibia**, is merely a change of place, not of function.

A cogent reason in support of amputation of the ankle-joint is, that to the compacted hardened tissue of the lower termination of the tibia are transferred and united, **for a cushion**, the thickened tissues, which have effectually served to protect the os calcis.

The place of those tissues is changed ; their accustomed **function** is unchanged and normal.

When the change of base and healthy union of the hard and soft parts are successfully accomplished, the same **condition** and **serviceableness** are gained for the end of the stump as are possessed by the natural heel. After a very short period of exercise the **sensations** become perfectly **natural**, and the end of the **stump** as **enduring** as the heel of the natural foot.

Numerous cases of ankle-joint amputations have demonstrated to me the **superior utility** of that operation to any amputation of the foot or leg. Of nearly one hundred cases which have come to my hands for mechanical treatment not one has failed of a highly gratifying success. Not every subject is in immediate condition for the adaptation of apparatus.

Some require preparatory and inuring treatment, before the application of apparatus.

Leg-makers who have only stereotyped apparatus to apply indiscriminately for amputations in the continuity of the leg, have treated such cases by apparatus as for amputation, allowing no weight at the end of the stump.

To illustrate : Captain ———, amputation at ankle-joint (Syme method) applied to ——— for apparatus. He was informed that because of a slight prickling sensation when he rested his stump on the floor, it should not receive any weight at its end. An artificial leg was applied, as in ordinary cases of leg amputation, to take the weight of the body upon its walls and the thigh, so as to suspend and relieve the end of the stump. The Captain entertained the plea of tenderness as valid ; but being very greatly annoyed by the weight and irritation of the apparatus, he sent for a surgeon of this city, who, upon examining the stump and appliance, immediately transferred him to me. I found his stump admirably well formed and healthy, except a little prickling sensation produced by hard pressure.

After ten days of preliminary treatment, during which a castment and foot were fitted, and trials made, the prickling had entirely subsided, the natural sensation of the heel was restored, and the patient went out walking without inconvenience. The sensation of prickling is no unusual one for persons to experience who have suffered an injury of the tissues of the heel or foot, when they have so far recovered as to begin to exercise the part.

It is a temporary sensation which exercise soon converts into a normal one. The objections to Syme's operation—tenderness, unsoundness and unreliableness as a basis of support, after the stump has become well healed—are fallacies.

The practice of Mr. Syme (original method) to exsect the articular surface of the tibia, and to remove the malleoli including the articular surface, is inexpedient. The increased vascularity of the cancelli protracts the tenderness of the face of the stump. Some surgeons strive to enlarge the base of support by sawing the malleoli off, at a line transverse with the end of the tibia ; but the practice is entirely unnecessary and in some respects prejudicial.

The articular surface should not be molested. The malleoli should be exsected, sparing the periosteum, at a beveling angle of

forty degrees. The **most serviceable and best proportioned stump is thus formed.** With the dense ivory structure, the cancellated and medullary tissues all preserved, other matters being equal, we may rationally anticipate the best results. The modified variety of Bauden's dorsal flap, or that of Roux, lateral flap, will never be chosen varieties, but adopted as dernier resort only. Even when the operation is **thus modified**, the stump is eminently **superior** for utility, with pressure upon its face, **to any amputation of the leg.**

The following wood-cuts, of Mr. Syme's mode, give a correct idea of the line of incision.



FIGS. 3.

"The principal **precaution** to be observed is in the dissection on the posterior part of the os calcis, in order not to wound the posterior tibial artery, and thus deprive the flap of its nourishment."

FIG. 4.

RESULTING
STUMP,
PHOTOGRAPHED.

I was the first in this country to originate and apply compensative apparatus for this operation; nor am I aware of any like treatment abroad.

With it I have invariably made the face of the stump the basis of entire support, and with no intervening substance, other than one or two thicknesses of soft flannel cloth. The apparatus is a light semi-cylindrical case for the leg, receiving the bulbous end of the stump in a concavity, at its lower end, fitting to the posterior parietes of the leg end and stump, whose base is entirely supported.

FROM PHOTOGRAPHS OF STUMP AND
ARTIFICIAL FOOT.—FIG. 5.

Wide leather bands lace up around the anterior half of the leg, to keep it in situ.

An **artificial foot, of natural size** and shape, is attached by a strong ginglymus ankle-joint, on a line nearly parallel with that of its mate. An **artificial tendo-achillis** passes up from the heel, through an inclosed groove into the calf of the casement, where it is strongly inserted. It **preserves the foot at a right angle** with the leg part. When the heel strikes the ground, the anterior part of the foot is depressed, but elevated sufficiently by rubber flexor springs, when the weight is off, to prevent tripping. The apparatus is covered with raw hide and a neat flesh-colored enamel. It may be dressed with stocking, shoe or boot, at pleasure, the same as its fellow. (See Fig. 5.)

I repeat : The great and **important feature** of the Syme operation at the ankle-joint is the natural, **philosophical basis of support** which the method retains, and the opportunity it affords, by a sufficient shortness, for the adaptation of a compensating artificial foot, and a ginglymus **ankle-joint in a proper place.**

The main and defensive feature of M. PIRIGOFF's modification is the increased length of stump, created by the excision of the tibia and calcaneum, and the annexation of a greater or less portion of the latter to the former, for the service of the "*poor man*," with the application of a "bucket" or "boot."

Statistics furnish abundant evidence that it possesses no superior advantage as relates to mortality, sloughings, necrosis, or other untoward events, over the Syme method; *nor even as a reliable basis of support.*

The same apparatus, modified, may be applied to the Pirigoff modification, though with less facility.

A patient of a Syme amputation never makes use of a cane, nor walks in any other than the most natural gait.

EXPRESSION OF A COMMITTEE OF MEDICAL MEMBERS OF THE SANITARY COMMISSION

ON THE SUBJECT OF AMPUTATIONS OF THE FOOT AND ANKLE, VIZ.:

"Of the amputations through the tarsus, or at the ankle-joint, preference should be given to Syme's operation, as affording a minimum mortality, with a stump best adapted to an artificial limb. An artificial limb may be applied to a Syme's stump, which both relieves deformity and renders the patient's gait free from the slightest halt."

Signed, STEPHEN SMITH, M. D., *Chairman.*

VALENTINE MOTT, M. D.

ALFRED C. POST, M. D.

GURDON BUCK, M. D.

WILLARD PARKER, M. D.

JOHN WATSON, M. D.

ERNEST KRACKOWIZER, M. D.

W. H. VAN BUREN, M. D.

The reported failures in military practice were no greater than it was rational to expect, and should not influence surgery in civil practice.

The healing is often primary. I know of several cases that have been cicatrized in thirty days' time; and in forty days were traveling without canes, or halt in their gait.

LETTER.

DR. J. M. CARNOCHAN to DR. J. SIMONS, *U. S. A.*, President of the Board for the Examination of Artificial Limbs for Soldiers and Sailors, and Medical Director, Richmond, Va.:

14 EAST 16th ST., N. Y., April 15th, 1865.

My Dear Doctor:

Dr. Hudson has just recalled to me a fact, which I very willingly confirm, **that he is the first to have given attention to the mechanical means suited to meet the conditions of the lower limb, after amputation through the ankle-joint known now as Syme's operation.** Having been a pupil of Mr. Syme, on a more recent visit to Edinburg, Syme was, at that time, engaged in introducing this operation, and soon after my return to this country, about 1852 or '53, I introduced the ankle-joint operation, I believe, for the first time here. Dr. Hudson, in 1854, adjusted his piece of mechanism on my patient much to my satisfaction. I make this statement, wishing to render justice to Dr. Hudson, believing, as I do, that he merits much credit for the various ingenious improvements he has added to mechanical surgery.

Believe me, dear Doctor,

Very truly yours,

J. M. CARNOCHAN,

Professor of Surgery, &c., &c.

To Dr. J. SIMONS, *U. S. A.*, &c.

FINAL RESULTS OF SYME'S OPERATION,

ILLUSTRATED BY CASES.

This cut engraved from photographs, represents the case of Kate Riley, described in the letter of Dr. Stephen Smith (page 8). The graceful appearance of the apparatus when dressed, and the fact of her having performed the duties of hospital nurse for many years, are the best of testimony to its ingenuity and utility.



SYME'S OPERATION WITH APPARATUS.—FIG. 6.

CASES ILLUSTRATING THE SUPERIOR USEFULNESS OF THE SYME'S STUMP WITH APPARATUS.

For incontrovertible evidence of the **entire reliability** of the end of the stumps **as bases of support**, without the least discomfort, I would refer to **sixty cases** of amputations at the ankle, denominated "Symes," but composed of **modified flaps**—posterior, lateral, bilateral and dorsal,—and to **four cases** of **double amputation** at the **ankle-joint**—all of which were perfectly successful.

I subjoin the following demonstrative cases :

DOUBLE AMPUTATION AT ANKLE-JOINT.

CASE I. — JOHN LYNN suffered compound comminuted fracture of tarso-metatarsus of both feet, by railroad casualty. Amputation of both feet at ankle-joint, at St. Vincent's Hospital, New York City, by Dr. J. W. S. Gouley. The healing was mainly primary, and the cicatrix was sound and complete in about six weeks. After a few days of inuring with leather bonnets, I furnished him with a pair of feet. They were adjusted for support to the end of the stumps, upon which he received the entire weight of his body, walking reliantly, and using his cane temporarily only in balancing. He then returned to his friends in Georgia and has written me of the naturalness and comfort with which he walks.

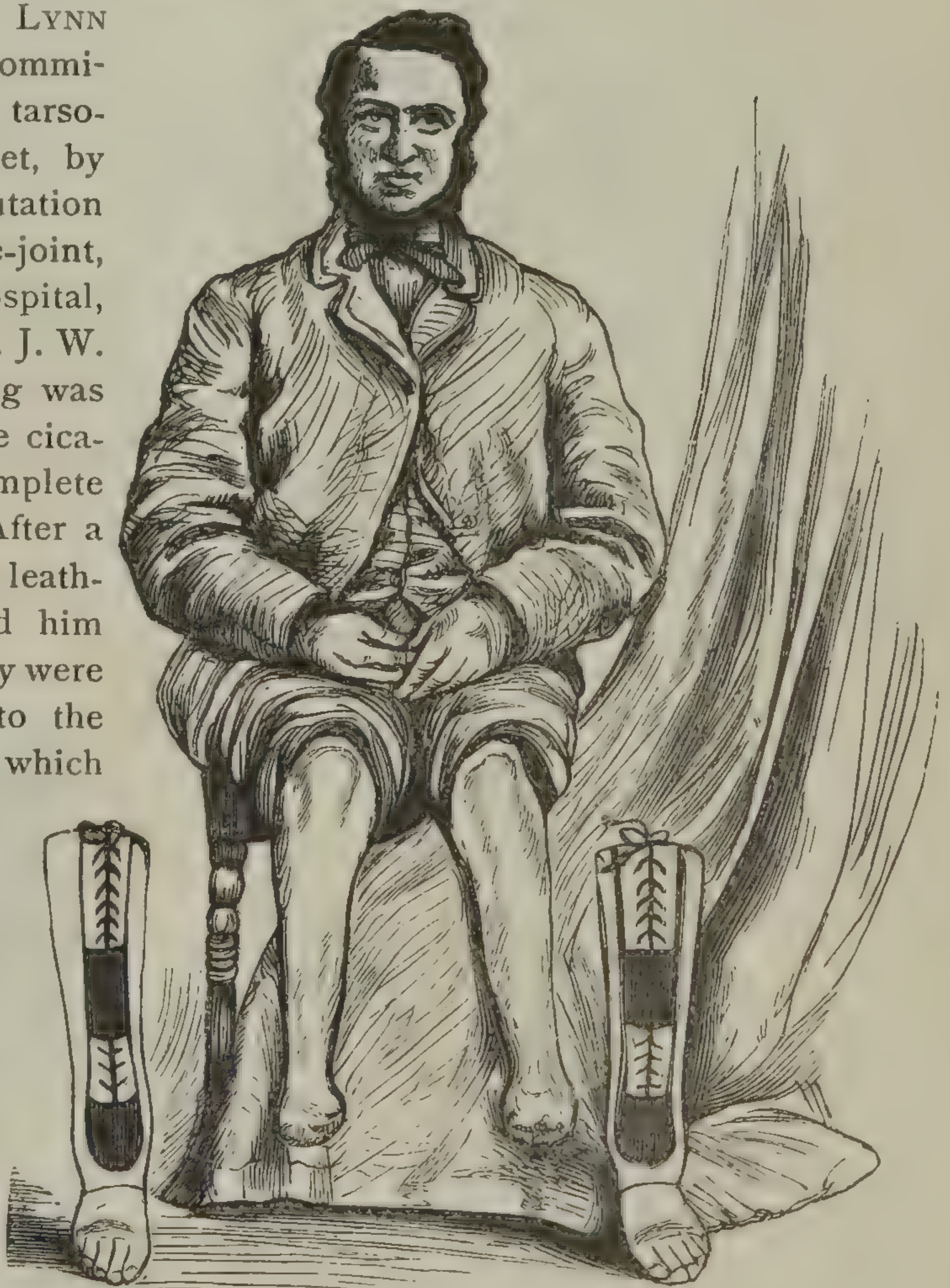


FIG. 7.

DOUBLE AMPUTATION AT ANKLE-JOINT.—BY MR. LISTER.

CASE III.—JOHN MILLER, Edinburg, Scotland, suffered compound, comminuted fracture of both feet—tarsal and metatarsal bones—by railroad accident, February, 1859. Both feet were amputated by Mr. Lister, Surgeon to the Royal Infirmary, at the ankle-joint, four hours after injury. He was furnished with leather bonnets which, with aid of canes, served for locomotion; he emigrated to this country. In 1869 he obtained a pair of feet from me. His sensations were normal, his balance perfect and support firm and reliable, without the aid of a cane.—(See Fig. 7.)

SECONDARY AMPUTATION AT BOTH ANKLE-JOINTS.

CASE III.—PATRICK KING, New York City, suffered compound comminuted fractures of tarso-metatarsal bones of both feet, by railroad casualty. At first, both feet were amputated at the mediotarsal line—(Chopart)—in Bellevue Hospital. Ulcerations and retractions of the flaps left the ends of the stumps uncovered. Secondary amputation of both feet became necessary, and was performed at the ankle-joints—(Syme's operation)—by Surgeon Stephen Smith, winter of 1868. The stumps healed quickly and well. In March, I ordered him to apply and practice with the leather buckets so as to inure his stumps. In April, I furnished and adapted a pair of feet, receiving the entire weight upon the ends of both stumps. He wears them constantly in his usual vocations, without the least discomfort, with normal sensations and natural gait.—(See Fig. 8.)

"AMPUTATION OF CONVENIENCE" AT THE ANKLE-JOINT.

CASE IV.—W. W. W., student of Theology, ready to graduate and receive clerical orders, had a very serious distortion of his foot and shortening of his limb, occasioned by talipes varus. He entered St. Luke's Hospital for an "amputation of convenience," which was performed at the ankle-joint—(Syme's method)—by Surgeon Gurdon

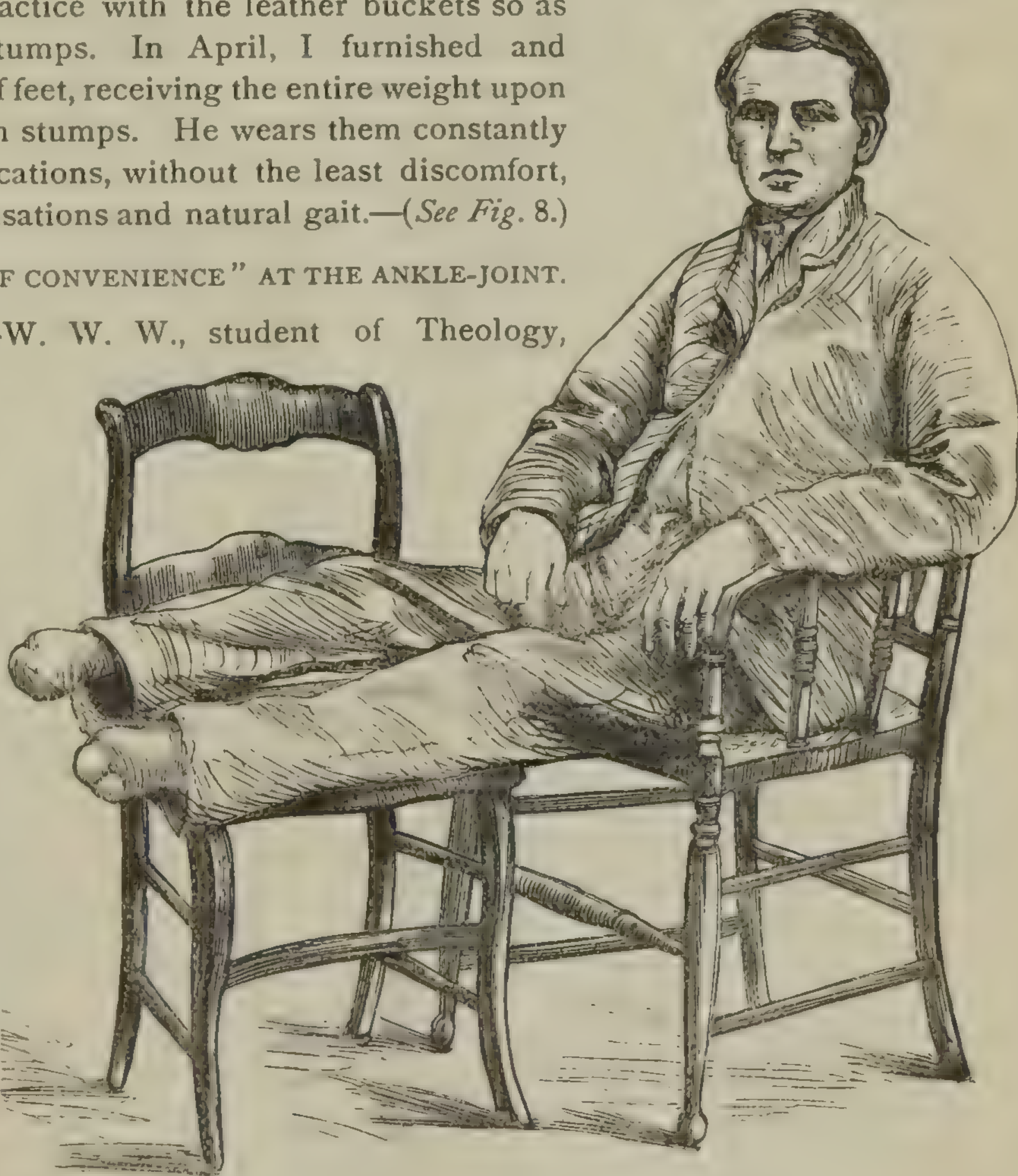


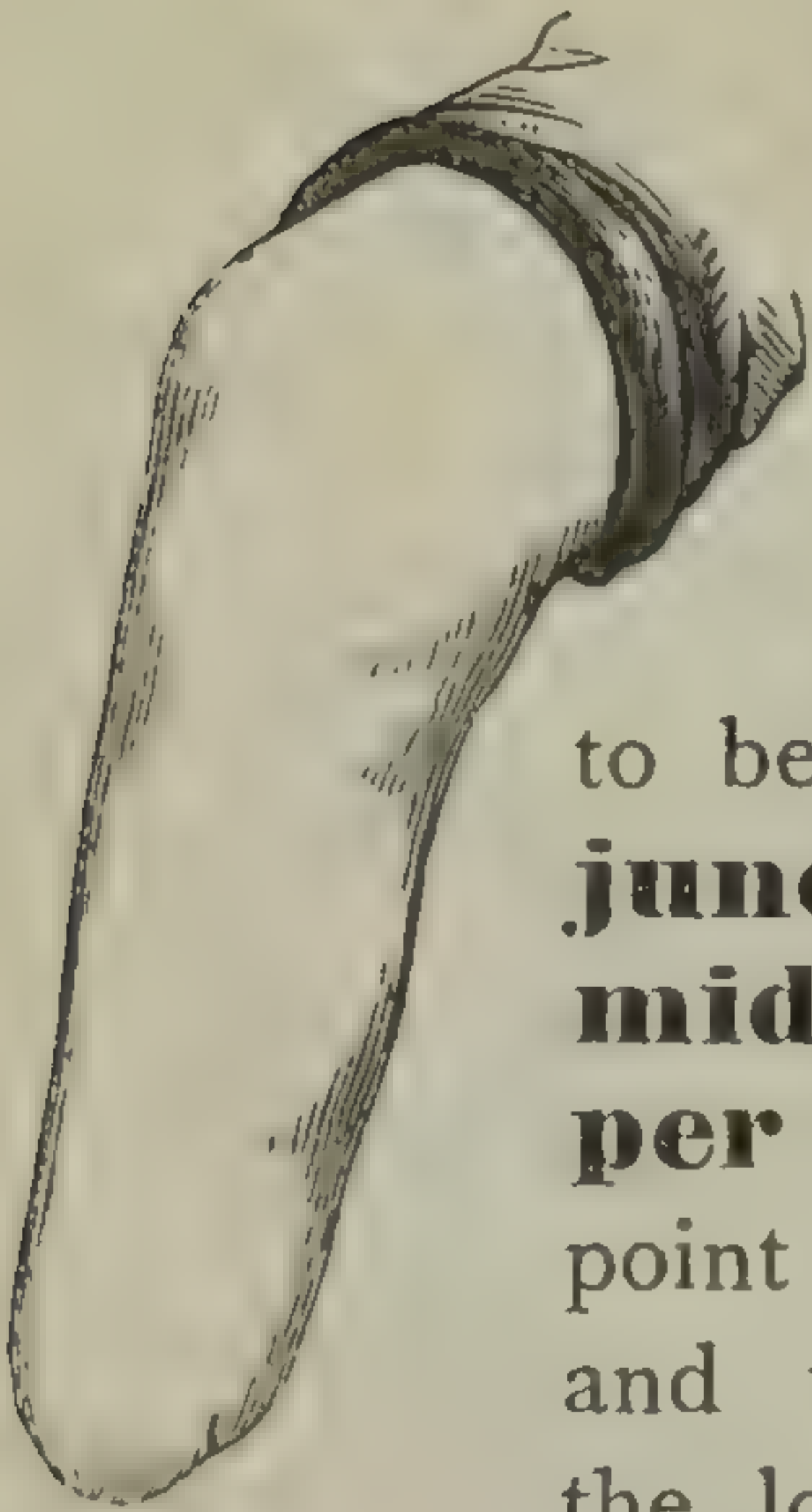
FIG. 8.

Buck, in the month of February. The healing was primary. In the latter part of April he returned to college, applied a leather bonnet to his stump, with which he began to take gradual bearing on its end. In June his stump became sound and inured. I applied a foot with which, in July, he appeared on the stage with his class, and since then he has performed his duties, with every appearance of an entire man. He suffers no discomfort from the end as an entire base of support.

THE SECOND PLACE OF ELECTION

is in the continuity of the leg, at the **junction of its lower and middle thirds**; by measure nine or ten inches from the lower edge of the patella.

FIG. 9.



With well formed and cicatrized **bilateral flaps**, the most serviceable stump of the leg is secured. With such a stump the final success and usefulness are secondary only to ankle-joint amputations.

THE THIRD PLACE

to be elected is at the **junction of the middle and upper thirds**, at a point three and a half and four inches from the lower edge of the patella. That is the highest part at which an amputation can be safely made, to have the artificial leg applied with a stump socket, and to retain therewith the use of the natural knee-joint. Such a length of stump, when well composed, and fitted with appropriate apparatus, does very satisfactory service. The use of the natural knee-joint is thereby secured to the patient, who appreciates its inestimable value.

The cuts represent a **model stump of the leg**, for an amputation below the knee, and an adapted artificial leg.—(See Figs. 9.)

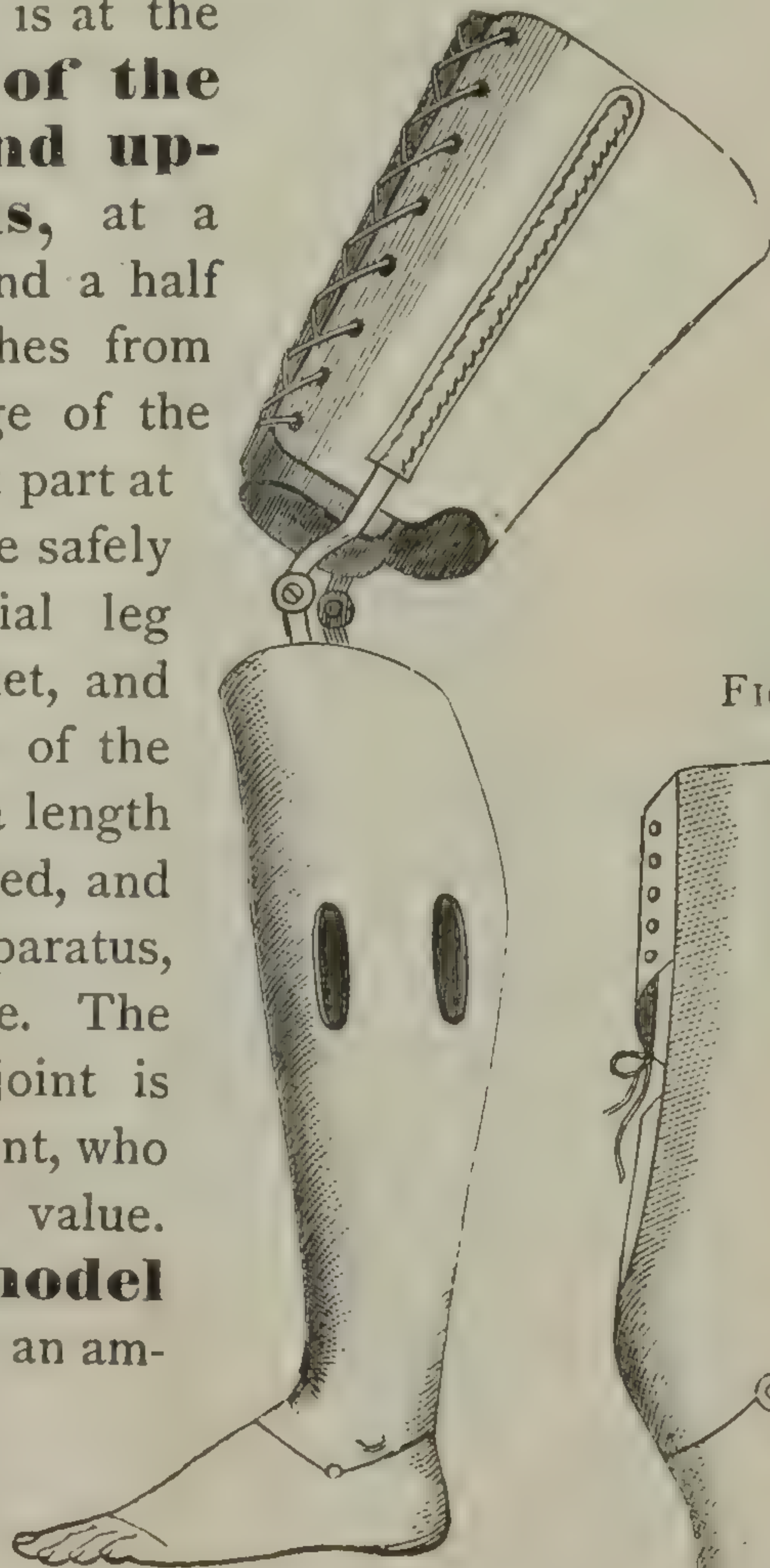


FIG. 9.

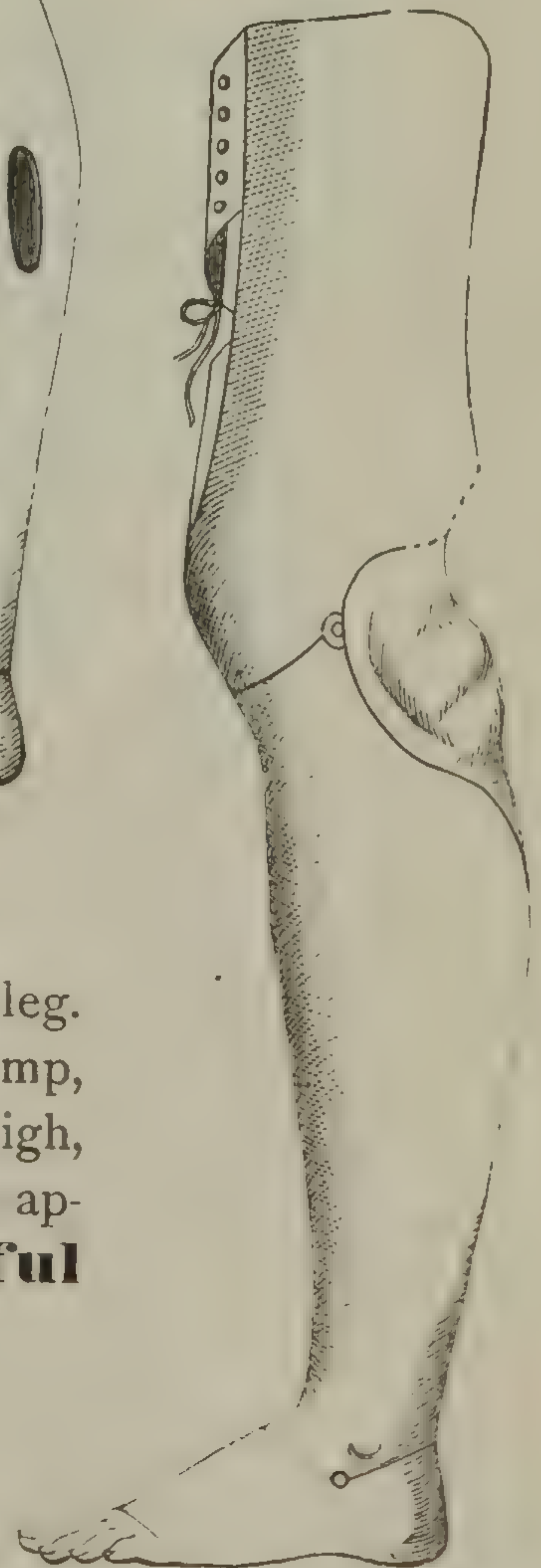
THE FOURTH PLACE OF ELECTION

is at the **extreme upper third** of the leg.

This place secures only a very short stump, which when flexed at a right angle with the thigh, makes a valuable **knee support** for the application of a leg, with an exceedingly **useful artificial knee-joint**.

For an amputation at the upper third of the leg, a limb is adapted, which personates the natural leg in **form, length and joints**, and in **movements, utility and comfort**.—(See Fig. 10.)

FIG. 10.



THE CUT REPRESENTS THE KNEE-SUPPORTING ARTIFICIAL LEG.

In amputations of the leg, in proximity to the knee-joint, the stump should be flexed at once at a right angle with the thigh, to anticipate the result of any affection of the knee-joint which may subsequently arise. I have had to contend with many very bad cases, in the apposition of limbs, because the surgeon neglected to flex the stump, which resulted in a complete ankylosis of the knee-joint, with the stump in an extended position. The face of such a stump being intolerant of support presents an unfavorable condition of limb for the best of treatment.

AMPUTATION THROUGH THE KNEE-JOINT.

This operation may be regarded one of the greatest and most humane improvements of modern surgery, when the **benefit of the patient** is taken into account. It is greater, in fact, than the very great one of Mr. Syme at the ankle-joint, when we consider the **comparative disability**, from an amputation in the continuity of the thigh, and that from a leg amputation in the continuity.

Amputation at the knee-joint is **superior** to one of the thigh in the facilities afforded for the proper adaptation of apparatus and its subsequent reliable use. **The operation** has attained a success which fully demonstrates its **safety**, while subsequent treatment, with improved and appropriate artificial limbs, determines **its superior utility**. When the condyles of the femur are provided with a long anterior or posterior flap, firmly united with corresponding short flaps, with or without the retention of the patella, the **base of support** which they present is pre-eminently superior to any possibly to be gained by a thigh stump from its walls and parts beneath the os ischium. The fitness of the

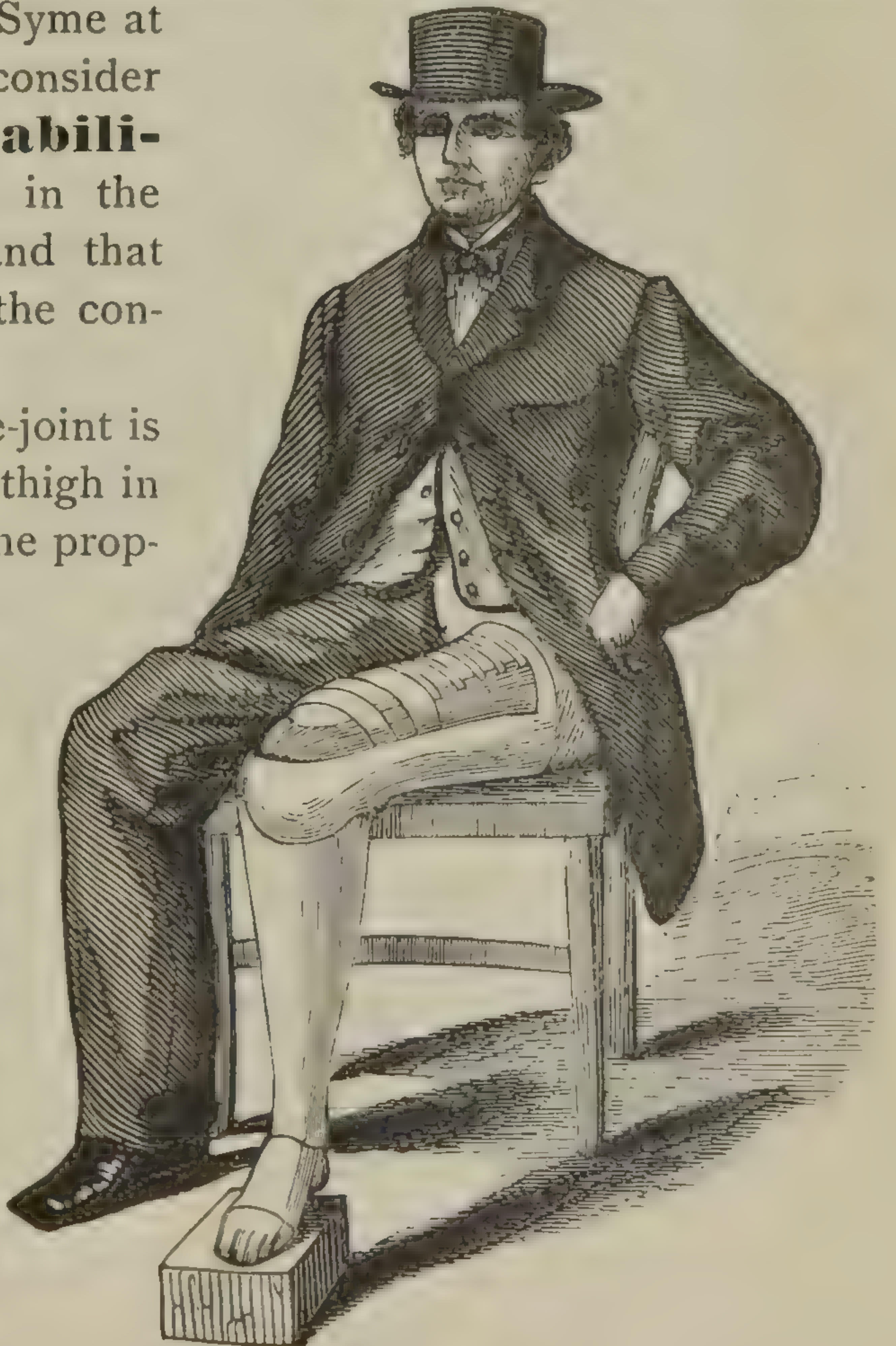


FIG. II.

THE ABOVE CUT ILLUSTRATES KNEE-JOINT AMPUTATION
WITH ARTIFICIAL LEG APPLIED.

articular surfaces, when clothed with a long anterior or posterior flap, or **even with anterior and posterior flaps** united and cicatrized over the face of the condyles, for such mechanical pressure as is experienced from the weight of the body, in the application of the artificial limb, must at once impress the anatomist and physiologist as natural and rational.

My experience in the treatment of many such cases, affords me the strongest evidence of the vast superiority of the condyles of the femur over the walls of the thigh for support and for locomotion

The exhibition of two cases to the Board of U. S. Surgeons, had the effect to conquer their pre-established prejudice to the operation and to create a lively interest in its favor. With a well-adjusted thigh piece arranged to fit the condyles and fossa, and with trunnion bolts to attach the leg and compose an artificial knee-joint, **without elongating the thigh** beyond its fellow, the patient is very perfectly compensated in his loss. The retention of the entire thigh for leverage is thus secured, and proves an inestimable advantage.—
(*See Fig. 11.*)

Of the varieties of flap the long anterior has presented the best results. It affords a smooth surface to the base, where pressure is in excess, and to the anterior angle which is the point of application of the lever power for the propulsion of the leg forward in taking the step. The posterior angle, less subject to pressure and irritation, is the location suitable for the cicatrix.

The bilateral flaps as improved by Dr. Stephen Smith, New York, **perfect this operation.**

In the operation the condyles of the femur should not be unnecessarily excised.

To exsect the epiphyses of the condyles, on a level with the superior surface of the intercondyloid fossa, to enlarge the basis of support, is altogether a gratuity, if not prejudicial. It is a gratuity as respects the base of support, and the adaptation of an artificial limb, which affords concavo-convex surfaces corresponding to those of the condyles, and may prove pernicious by injury to the tissues, and their consequent protracted tenderness.

THIGH AMPUTATION.

This operation inflicts a greater degree of disability than any other of the inferior extremity. Yet, with **suitable means**, the impairment can be largely compensated, and the subject is able to re-engage in ordinary pursuits.

The **choice of place** for the incision is at the junction of its **lower and middle third**. The most perfect stump is

composed by the **bilateral** or the circular operation, or a modified variety, the union of the two ; the angle should not extend up the anterior aspect of the stump, but mostly upon the posterior. The artificial leg should represent the general **formation** and **functions** of the natural leg, and be so applied as to yield full obedience to the retained powers of the stump.

The disparity in manner of locomotion, between those wearing artificial limbs, is not always occasioned by the greater or less physical advantage they possess ; neither by the quality of the artificial limb they use. Some men are natural acrobats, can readily and perfectly balance. Others are easily trained to a graceful and easy movement, have precision and enterprise. But others are timid, irresolute, despairing, and lacking those faculties, which generally insure the more creditable performance and greatest usefulness.

CASE.—J. C., private 104th Reg't N. Y. Infantry, amputation of thigh in its upper third, stump only **two inches long**. His condition and habits bad : one of the most unpromising patients at the Central Park U. S. General Hospital. By a studied and persevering effort, a limb was successfully applied in July, 1864. With a little initiatory practice, he soon became an **object of admiration**, and astonished the entire medical corps and inspector, by his expert and natural locomotion. His ready **perceptions** and indomitable **will** greatly compensated his extreme physical disadvantages. He



FIG. 12.

LEG FOR THIGH STUMP.

was discharged a little time after the limb was applied, immigrated to northern Illinois, where he is at work getting out timber and running a buzz saw. He wrote in July, 1866, that he seldom used a cane (only for long walks), carried timber in and out of his mill, and that he was prepared to compete in walking with any one who had suffered a thigh amputation, even though possessed of a more favorable length of stump.

AMPUTATION AT THE HIP-JOINT.

Amputation at the hip-joint has been considered an operation so formidable as to entirely incapacitate the patient for the comfortable adaptation and use of an artificial limb. Surgeon and subject alike have been so impressed. Hence the few cases surviving this extreme mutilation have **been left**, after the successful

prolongation of life, **without any** worthy **effort** to further **compensate or ameliorate** their condition. We have seen in a Leipzig Medical Journal a cut of a contrivance, the only one of which we are aware, for the application of a prothetic apparatus, but so rude in its construction as to be of little use.

It is owing to the progress and zeal of the Surgeon General U. S. A. that such cases are now made to assume an interesting and humane aspect. In

1867 I was requested by the Surgeon General to examine and report the condition of L. F., and also state what could be done for him and other similar cases, by prothetic appliance. As the result of this correspondence, **an artificial stump**, of the conical shape of the natural thigh, was **improvised**. The material was gutta percha. It was so **adapted to the Ischium**, and innominate generally,



FIG. 13.

by carefully arranged padding and fitting, as to receive the **weight** of the body **evenly distributed**. It allowed of **flexion for sitting** and supplied **leverage for propulsion**.

It was firmly and comfortably attached by a broad, strong waistband.—(See Fig. 13.)

(This **artificial stump** is also admirably adapted **for very short thigh stumps**.) It served effectively for leverage. **It commanded** reliably and gracefully **the artificial leg** which was fitted on over it the same as over the natural stump of the thigh. As a result, this and the other survivors of hip-joint **amputations, thus treated** by special commission, were **enabled to walk**, with the aid of a cane, **in** the in-

cient trial of **one week**, from the New York City Hospital to my office, a distance of **two miles, and return**. Their **appearance** was as comely as any patient with a good thigh stump. **Dr. Geo. A. Otis** of the Surgeon General's office was



FIG. 14.

commissioned to visit my office **to examine** the **success** of the experiment, after which he wrote as follows :

“Your achievements in furnishing limbs for the cases of hip-joint amputations, I regard as real triumphs in Mechanical Surgery.”

(*Extract from “American Journal of Medical Sciences,” January, 1871.*)

“ART. XIV. MEMORANDUM OF A CASE OF RE-AMPUTATION AT THE HIP-JOINT.”—
GEO. A. OTIS, M. D., *Asst. Surgeon, U. S. A.*

“I add a paragraph to refer to a prosthetic apparatus for survivors of amputation at the hip. By using a gutta percha stump, nine or ten inches in length, firmly strapped to the pelvis by a broad chamois lined canvas band, an ordinary artificial limb for thigh stumps can be used. In two cases, under my supervision, this expedient has been employed by Dr. E. D. Hudson, 696 Broadway, N. Y., and the mutilated men have walked better than most men with artificial limbs, who had been amputated at mid-thigh.”—(*See Fig. 14.*)

RESECTION OF HIP-JOINT.

APPARATUS FOR RESECTION OF HEAD AND NECK OF THE FEMUR.

CASE.—CHAS. F. READ, U. S. A., had compound, comminuted fracture of the neck of the femur—caused by gunshot wound. It necessitated resection of the head and neck of the femur, performed two months after injury, at Fort Stanton, New Mexico, by Surgeon Gibson, U. S. A. **To fix the truncated femur in situ, favor a ligamentous union, and for support,** an apparatus was applied. The **innominatum** was **one point of support**, and an **inclined plane beneath the foot, compensating the shortening** of the limb, was the **other point** of support—steel braces and joints intervening. The appliance enabled him to walk without a cane and with ease. It commanded the femur in situ. Without the apparatus, movement caused the femur to thrust backwards and forwards and prevented locomotion.—(See Fig. 15.)



FIG. 15.

SURGICAL SPLINT FOR UNUNITED FRACTURE OF FEMUR.

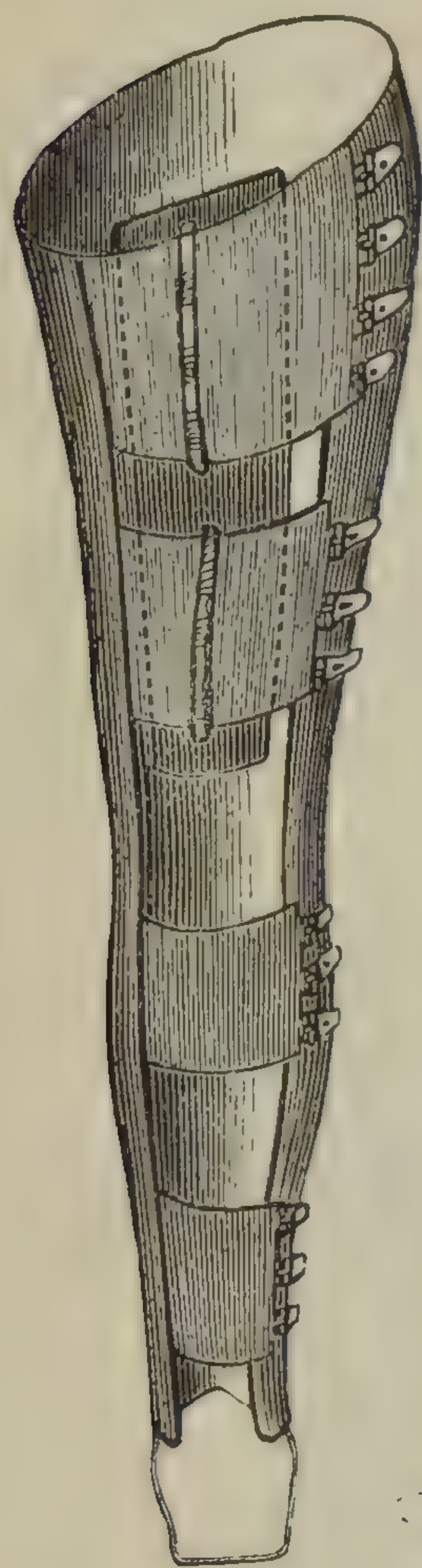
(Extract from *Hamilton on Fractures and Dislocations*.)

“As a means of combining immobility with compression and healthy exercise, the apparatus immobile, in many of its forms, is peculiarly adapted. Dr. E. D. Hudson, of New York, has applied in similar cases an apparatus of his own construction, made of willow, and secured in place by leather straps. In case the purpose of the apparatus is to encourage bony union, no motion is allowed at the knee-joint.”

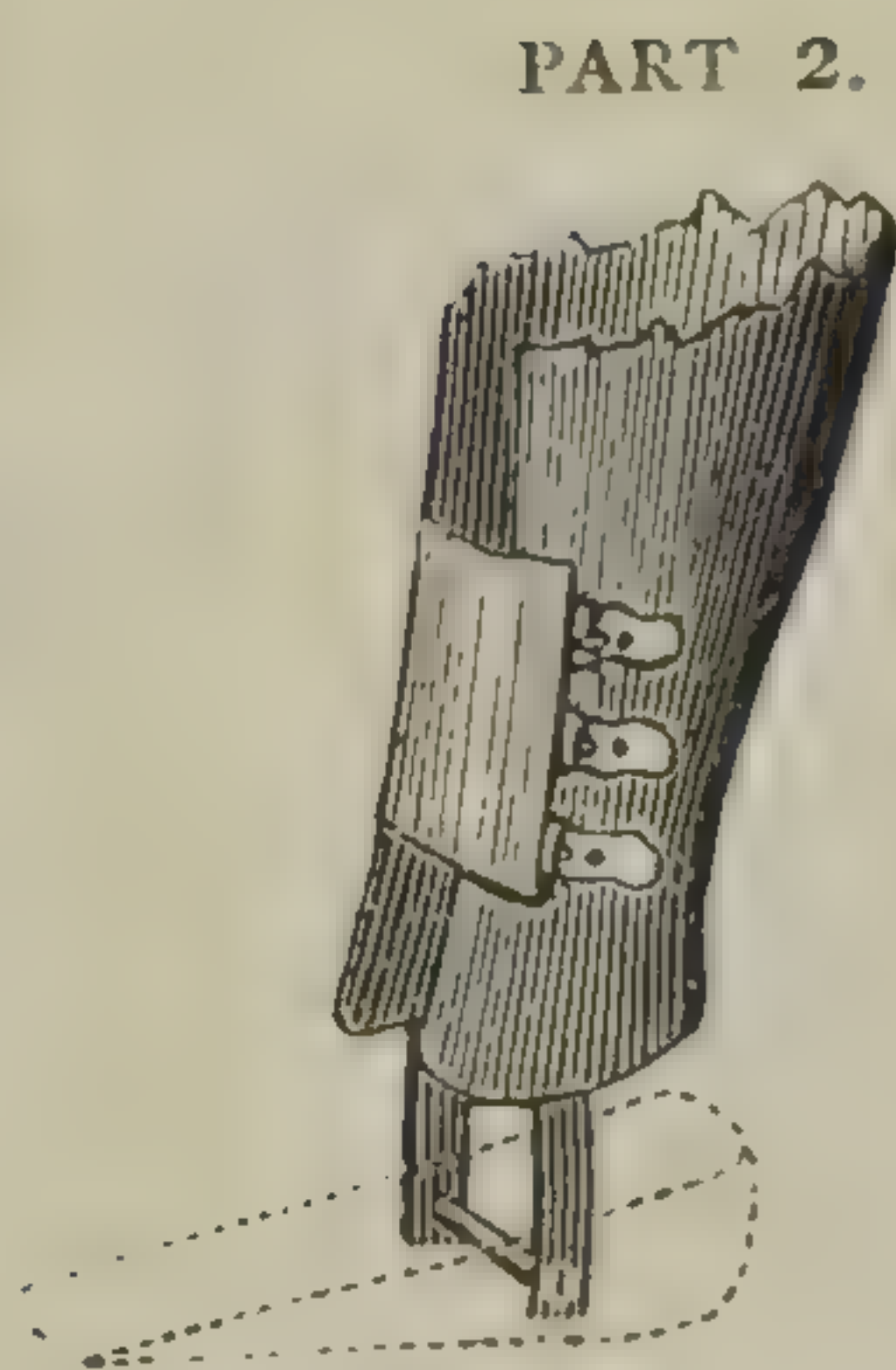
This splint was originally furnished a middle-aged lady for an oblique fracture of the lower third of the femur, of which the parts had failed to reunite. After an unsuccessful resort had been had to the introductions of setons, Dieffenbach's plugs, and other expedients, to excite an action of the opposing surfaces and surrounding tissues favorable to a reunion, it became desirable to furnish the patient a means of exercise in walking. The limb was shortened by overlap

ping of the fractured parts one and a half inches, sufficient to allow the introduction of an inclined plane under the heel. A bolt pass-

FIGS. 16.



PART 1.



PART 2.

SPLINT WITH STEEL
STRAP BASES.SPLINT WITH INCLINED
PLANE BASES.

ing at right angle through the inclined plane, connecting the splint to the latter, served as the lower point of support afforded by the splint; while the thigh socket, fitted to the parietes of the thigh, above the fractured part, and extending up beneath the glutei muscles and perineum, constituted the superior point of support. The primary object in this case was to keep the fractured parts in situ—to oppose the threatened protrusion of the superior fragment; while the final object was to compact the limb in the semi-cylindrical and immobile splint, and with a short splint over the anterior fractured parts, the whole limb being kept in place by strong leather bands, to effect a reunion. The action of the splint was every way satisfactory, to enable her to have the desired exercise and retain the fractured parts in apposition. The lady went off to a remote part of the country. I

anticipated a reunion of the fractured parts if the use of the apparatus should be carefully persisted in. When the limb is not shortened, the inclined plane is dispensed with, and steel straps pass down under the foot, and constitute the lower point of support. Knee and ankle-joints are appended to the splint when desirable.

This appliance is growing in popularity, for its **efficiency** and the facility it affords the subject for **reliable locomotion** and **exercise**—while it keeps the **parts in situ** and **invites reunion**.—(See Figs. 16. Parts 1-2.)

Three other cases, similar to the above, have recently been enabled to rise from their beds and use their limbs with freedom and comfort, with favorable prospect of reunion. One case was thus treated preparatory to an operation by Prof. Frank H. Hamilton. The operation proved unsuccessful, but the patient continues about with his splint.

RESECTION OF THE TIBIA.

A modified form of the splint for ununited fractures I have arranged and applied with the best effect for resection of the tibia.

Several cases of **excision of three to four inches** of the **tibia**, while the fibula and the leg were of the normal length, have been **restored to usefulness** and locomotion without

FIG. 17.



RESECTION OF TIBIA.

the aid of a cane by the adaptation of this modified appliance. The *points d'appui* were established in the sole of the shoe and at parts above the excision, while the semi-cylindrical case and leather bands kept the superior and inferior parts of the leg in their relative positions.

The treatment **fulfils two indications**, viz.: allows of the **formation of intervening osseous tissue**, while it enables the patient to engage freely in his **accustomed avocation and locomotion**.

DEFORMITIES AND DISABILITIES OF THIGHS AND LEGS SHORTENED BY FRACTURES AND RESECTIONS.

During the late war, many cases of extensive fracture of the thigh and leg were produced by gun-shots, and, by the creditable effort of surgeons, the limbs were saved, but in a condition of great shortness, distortion and disability.

Numerous cases of such a character have been assigned to me for compensative treatment, by special orders of the Surgeon General United States Army.

They have resulted very creditably in naturalness of length and appearance and locomotion.

The following *cuts* and history of two cases illustrate many others which I have successfully treated.



FIG. 18.

FIG. 19.

CASE I.—J. F., Private Co. F., 127th N. Y. Infantry, wounded in his right thigh by a musket ball, in S. C., November, 1864. The femur was shortened seven inches, and seriously distorted. The soft tissues were very much damaged and wasted by abscesses; the motion of the knee-joint limited, the foot rigidly

extended, arch increased, the whole limb suffering extreme debility and partial paralysis.—(*See Fig. 18.*)

To the foot, leg, and thigh, both lengthening and supporting appliance were adapted, which, in full dress, personated his well foot and limb; and on it he walked with great naturalness and comfort. Six months after the apparatus was furnished, he reported himself as walking ordinarily without the aid of a cane, with scarcely any halting gait, and performing the duties of a watchman, which required much activity.—1870: Has excellent use of his limb.—(*See Fig. 19.*)

CASE II.—J. J., Private Co. I, 7th N. Y. Heavy Artillery, was wounded in the upper third of the right thigh, by a minie-ball, at Cold Harbor, Va., June 3d, 1864; was taken prisoner; seven inches of the shaft of the femur were excised from and beneath the great trochanter, the second day after injury. His foot became rigidly extended, its arch very greatly increased, on the one part by morbid contractions, and on the other by partial paralysis. In September, 1865, I furnished extending and supporting apparatus to his foot and leg; a concave splint, with oscillatory joint, to support the injured and debilitated parts of the thigh. The success was very perfect, enabling him to walk on rough ground, in the woods and over fields on hunting excursions.

APPARATUS

FOR PARALYSIS OF EXTENSOR MUSCLES OF THIGH AND LEG, AND FLEXORS OF THE FOOT; FOR RUPTURE OF TENDON RECTUS FEMORIS AND LIGAMENTUM PATELLAE, AND FRACTURES OF PATELLA.—(*See Fig. 20.*)

In paralysis of one or both legs, and flexors of the feet, this apparatus has proved eminently serviceable for **extending the leg on the thigh** and for **flexing the foot** on the leg, and, by a continuation of the appliance and power, to extend the thigh upon the body. By an efficient representative power of the glutei, rectus femoris and tibialis anticus muscles, 1st, it secures complete **extension**; 2d, **passive motion**; 3d, **restoration of debilitated, physiological functions.**

By omitting the foot stirrup, it is made a power and support—(*See Fig. 20,*)

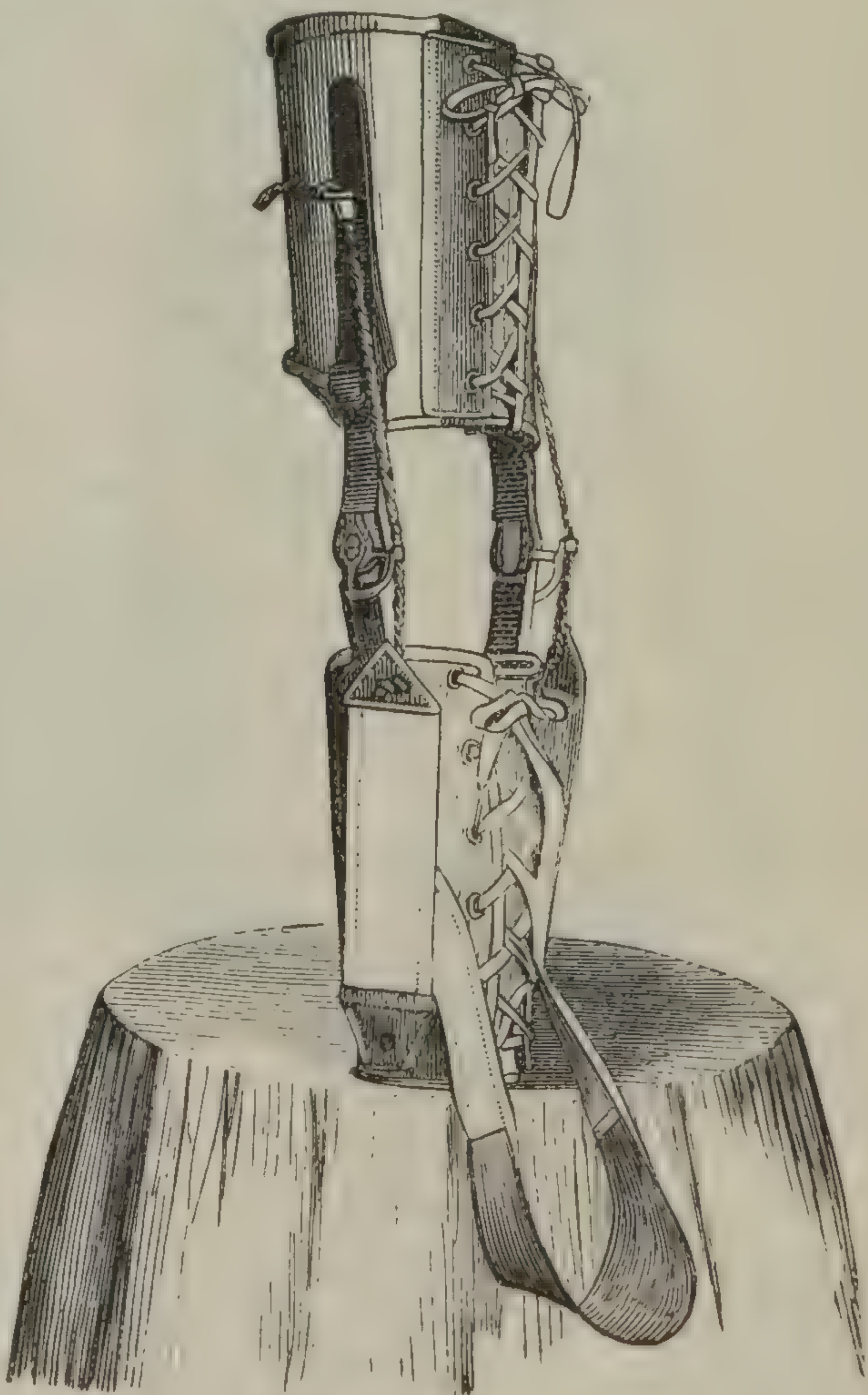


FIG. 20.

—even to immobility—for **ruptures** of the **tendon of the rectus** femoris for which I have had repeated occasion to apply it—one case of rupture of the rectus tendons of both legs. Another case was a **fracture of both patellas**, which completely disabled the subject—a heavy woman—who, with these appliances, was able to rise and walk with canes about her house. **The apparatus** can be rendered **mobile or immobile** by increase or diminution of its power.

HIP-JOINT DISEASE.

APPARATUS FOR MORBUS COXARIUS AND CONGENITAL DISLOCATIONS.

The number of those on whom the disease and injury have wrought their results demands an **appliance** which shall **alleviate** their irremediable **deformities**, and enable the sufferer to **use** and **exercise** the deformed limb in a manner likely to conduce to health, ease and **beauty of dress**.

Some fifteen years ago I undertook, for the first time, the treatment of such a case, the applicant being a young lady, and with a success which has continued to the present time a rich reward by its utility and improvement of her general health; since which time the apparatus has been so modified and improved as to be **applicable alike to men and women**, and proved gratifying to all to whom it has been adjusted. It is light, strong and durable, and when applied gives the patient the **appearance, in dress, length of limb, and action of the foot, of being whole**, and enables him to walk a great distance without fatigue.

Numerous **cases** have been presented for my advice and treatment. One young man of this city, whose limb was shortened six inches, who had been **burdened with a heavy cork-boot**, which, by its weight and dragging movement, greatly **impaired his health and grace of action**, says that no consideration would induce him to part with the artificial foot and its salutary effects. One young lady, with her limb shortened eight inches by congenital dislocation and lack of growth, now passes with her schoolmates as being apparently whole. There are many similar interesting cases to whom I am permitted to refer those who may desire such appliance, and to inform themselves of it by seeing its application and action.—(*See Fig. 21.*)

EXPLANATION OF FIG. 21.

The deformed limb below the knee is inserted in a light case, accurately fitted to the shape of the leg and ankle. It is retained by soft leather bands, laced in front.

The **foot** rests **on an inclined plane** so as to **reduce** the anterior-posterior **distance from toe to heel**. A calf-skin boot or gaiter, full at the instep, may then be drawn over the whole, and **pants** of the **usual shape and size** can be worn, and will entirely conceal the deformity. All parts are properly padded. The **artificial foot** corresponds **in size** with the foot **of the other** leg. The artificial ankle-joint **obviates** the excessive **limping** and **physical strain experienced in the use of cork boots and stirrups**. It also allows the patient to gain the **natural length of step**.



FIG. 21.

APPARATUS FOR RESECTIONS OF SUPERIOR EXTREMITY.

The possibility of **compensating** the **osseous structure, powers, and functions** of the arm, that has suffered by resection, and restoring it to usefulness, had not been entertained by surgeons in this country prior to the war—neither has it been in Europe. Even previous to 1862—when I was first incited by the application of a volunteer soldier, with nearly five inches of his arm and fore-arm resected, to devise an apparatus which should restore his arm to usefulness—a supporting splint was all that had been expected.

The apparatus which I furnished him—and a like case soon after—so far restored the fore-arm to the exercise of its normal powers as to enable the patient to carry a dumb-bell of many pounds weight, with the arm and fore-arm extended at a right angle with the body, and thence by flexion to his head, and to engage with his accustomed usefulness in his usual vocation as a farmer.—(See *Figs. 22-23.*)

The successful issue of the case being reported to the Surgeon-General of the United States army, special orders were given for

apparatus to be furnished for other cases—of **excision of the head and shaft** of the humerus, **of the entire humerus, etc.** Their treatment was followed by the detailing of a



FIG. 22.

RESECTION OF THE ELBOW.



FIG. 23.

RESECTION OF THE ELBOW TREATED.

Board of Surgeons to examine the merits of the apparatus. The apparatus presented—its artistic beauty, the scientific and anatomic principles observed in its construction, and adaptation, the **physiological functions** which it supplies either in whole or part, and its **great practical success**—secured for it an extended consideration. It received the highest personal encomiums of the members of the Board, and was deemed of such importance as to merit a separate commission. This commission applies to all cases of **resection**—of the **humerus—ulna and radius**—as well as of the **joints**.

I have been the first to propose to the profession the treatment of resections of the elbow and shoulder with compensative apparatus. Over two hundred cases in military and civil practice have been successfully treated during the past six years. **To supply lost leverage, to give rigidity to the muscles, to restore the functions of flexion, extension, pronation, and supination**—impaired by wounds of the muscles or motor nerves—and leave the arm in a **condition favorable to the reproduction of bone, and possible reunion**, are

the objects sought and obtained by this apparatus. It is destined to work a great change in the operative surgery of the superior extremity. With its introduction, the **only objection to resection—uselessness** of the mutilated arm—is **obviated**. This operation will be almost exclusively substituted for amputation.

A more extended treatise on resections, and their treatment with apparatus, is contained in a Monograph—"Remarks on Exsections, with Cases and Plates, by E. D. Hudson, M. D., New York." The above monograph contains descriptions of selected cases of resections, including resections of the shoulder and elbow-joints, resection of the entire humerus and heads of the ulna and radius, resection of the upper, middle and lower thirds of the humerus, and resection of the ulna and radius.

These cases, viewed individually and collectively, throw much light on the many questions of expediency—the comparative success and utility of different modes of incision, the retention of a single articular surface, &c.—involved in the subject of resection; while the application of apparatus, of recent suggestion, demanding the retention of every power and function of nerve and muscle, so far as is possible, sets aside the modes of operating formerly employed, which, seeking no such end, mutilated both, looking only to the successful removal of bone, speedy healing, and the formation of a false joint or intervention of ankylosis.

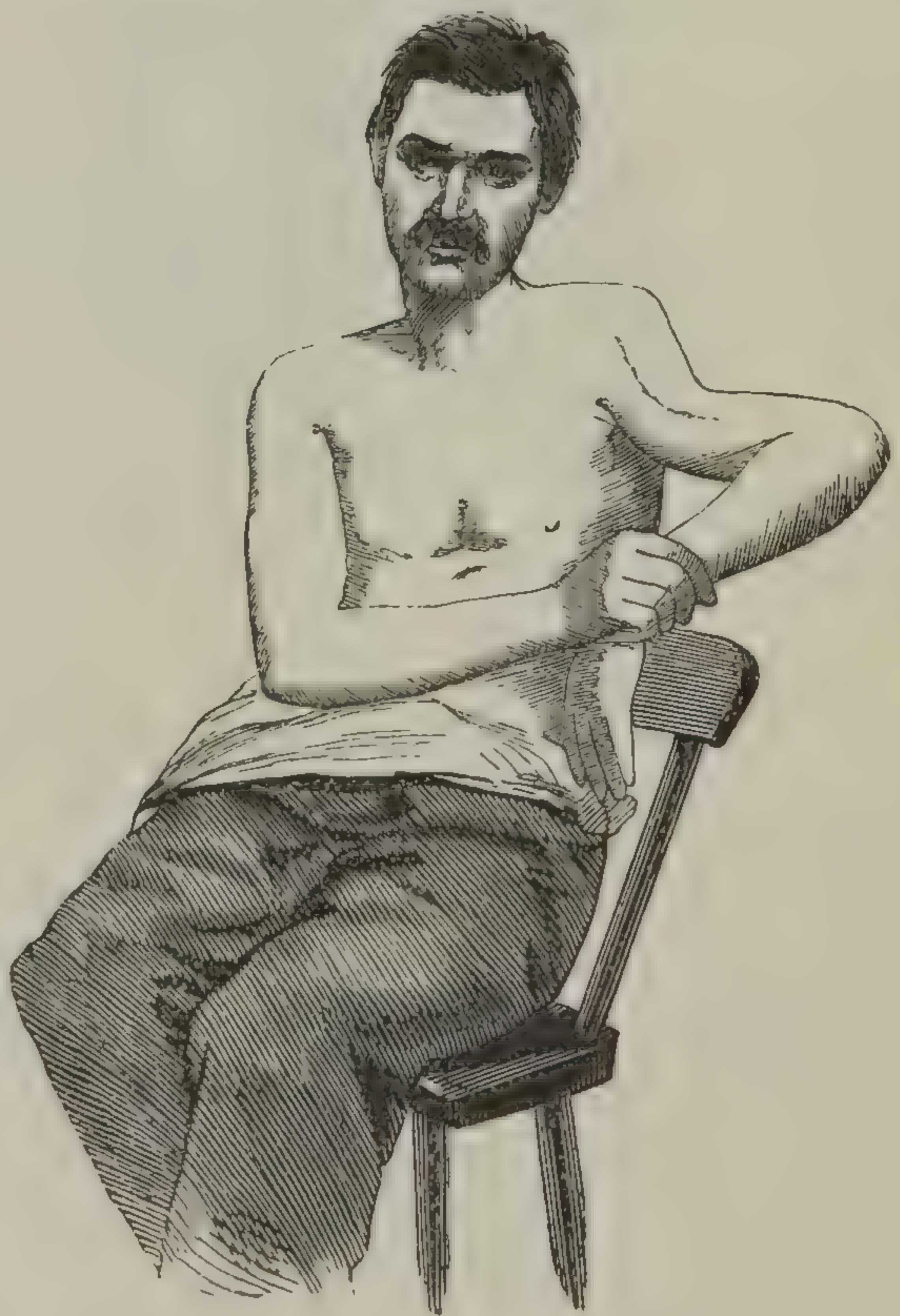


FIG. 24.

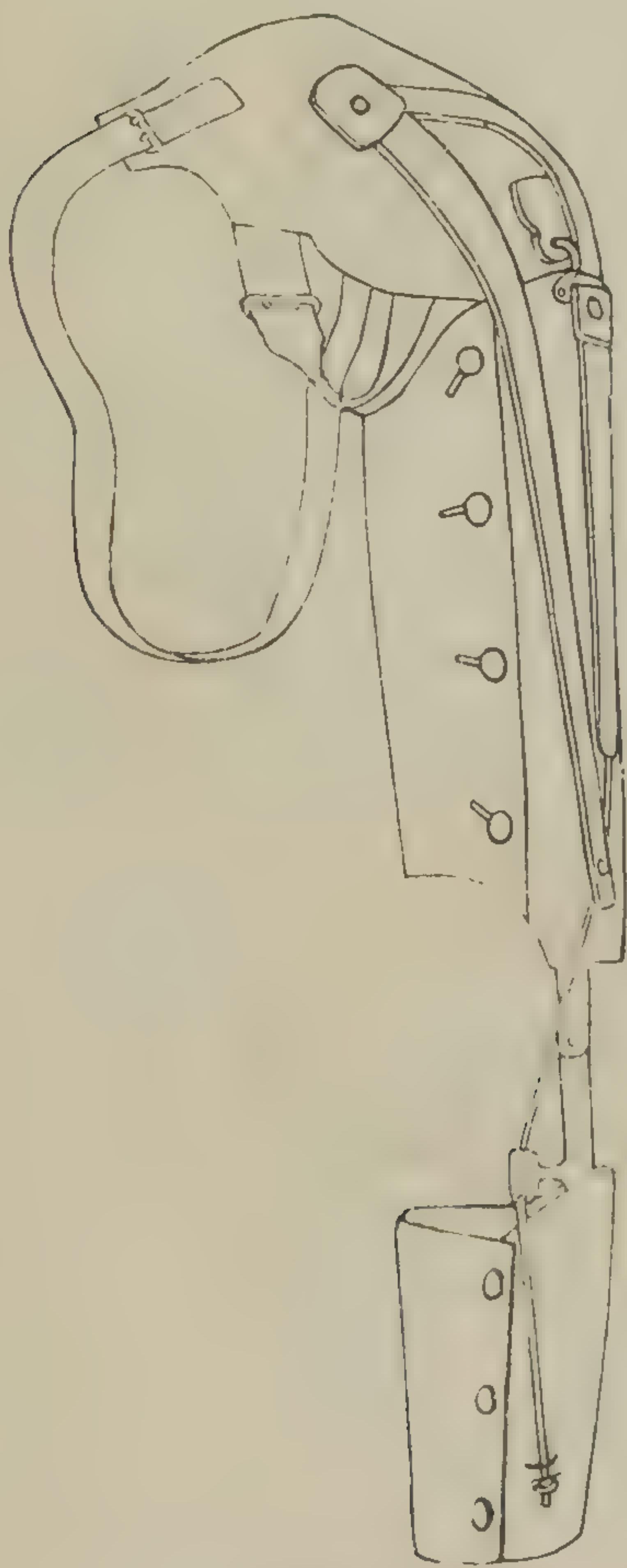
CASE OF RESECTION OF THE SHOULDER-JOINT.

The apparatus, or rather the **system of apparatus**—for **each case demands an individual appliance**, modified by the site, mode, and extent of operation, and the number of functions retained or impaired—is not intended to act upon the injured arm as a passive object alone, but to **facilitate** the **use** of every power and the **exercise** and **ultimate restoration** of lost vigor and impaired functions.

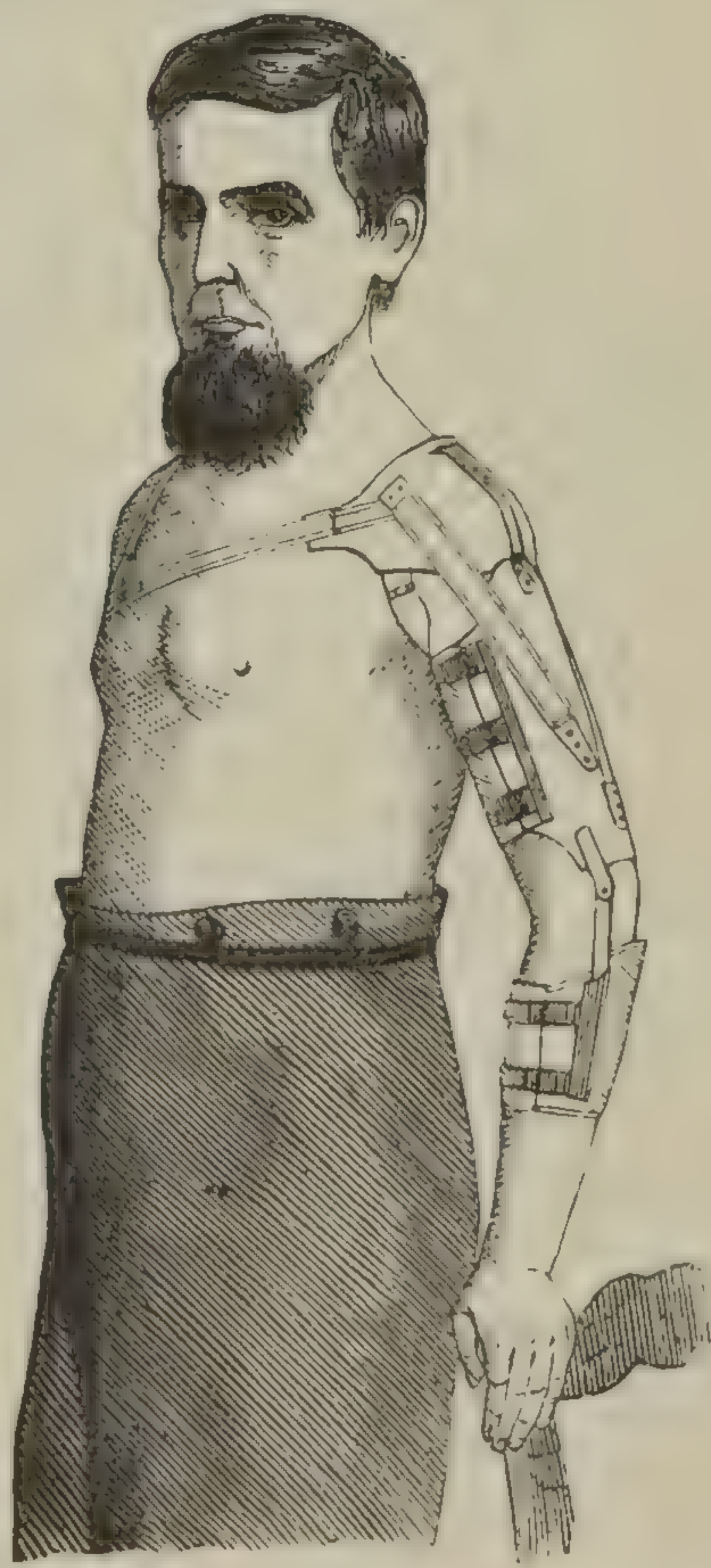
Where the nerves or important muscles have not been destroyed,

its usefulness is immeasurably augmented rather than obviated, as has been erroneously supposed. It retains the different parts at desired distances from each other, supplies the place of the removed bone for leverage, holds the muscles within their proper limits, and augments their power by compressing them, as the pugilist bands his arm. A patient with resection at the elbow, when the insertions of the brachialis anticus, biceps, and triceps, have not been impaired, can pull forcibly and carry much weight in a vertical line, but with an apparatus he can in time raise heavy weights to the head, strike powerfully, and perform all that necessity requires with ease. Hence the **superiority of its use to** reliance on **anchylosis or** the formation of a **false joint**.

FIGS. 25.



APPARATUS FOR RESECTION OF SHOULDER.



RESECTION OF SHOULDER WITH APPARATUS APPLIED.

The **weight** of the entire arm being **suspended by the apparatus**, the injured, debilitated, and **atrophied muscles** of the shoulder are not only relieved of that burden, but are **thickened and toned** up by the support afforded by the appliance. By **exercise** they soon begin to **gain tone and contractility**, and to **regain** their **natural power**.

The truncated humerus is drawn upward to a greater or less extent in proximity to the glenoid cavity—in some instances in juxtaposition with it, or the acromion process, where a **false joint** is **formed** by ligamentous tissue of sufficient strength and motion, to permit, in process of time, the disuse of the apparatus entirely or in part. By such treatment I feel assured that many cases of extreme excision of the humerus will **eventually** subject the patient to **little or no inconvenience**, except by the loss of length. In no instance should the arm or fore-arm be sacrificed by an amputation, except when vital tissues have been destroyed by injury, or are involved in malignant disease.

EXTENSOR APPARATUS

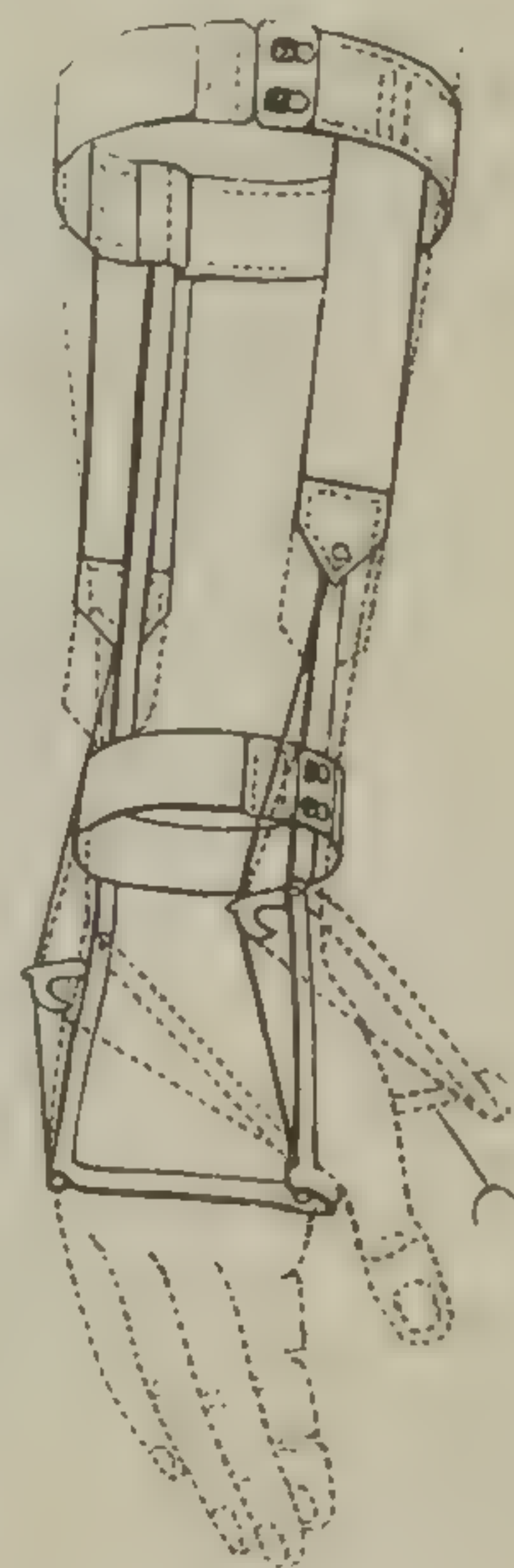
FOR PARALYSIS OF THE ARM, FORE-ARM, WRIST AND FINGERS, HEMIPLEGIA, INJURIES OF NERVES, LEAD POISONING, ETC.

This **therapeutic apparatus** (*See fig. 26*), I originated primarily for paralysis of the extensor muscles of the wrist and hand, produced by lesions of the ulnar and median nerves, caused by gunshot wounds or during operation of resection of the os brachii, elbow-joints, ulna and radius. It served its purpose admirably as an invaluable **auxiliary to nature**, to **extend the fore-arm, hand and fingers**; to **antagonize** and alternate **the flexor muscles** of the fore-arm, wrist and fingers, until the functions were regained, and sufficiently healthy and vigorous to be independent of aid.

I was soon led to extend and modify its construction for application to the arm, fore-arm, hand and fingers, for cases of hemiplegic and lead paralysis, with a highly gratifying result. **For** what is commonly termed “**wrist drop**,” its **action** has been eminently **beneficial**. In its incipient use, the action is representative; its therapeutic effect is to produce **primary passive motion**; subsequently it serves to **aid volition** and a sanitary condition. Its levers, joints, stanchions, tendons and representative elastic springs or power, are efficient aids to **restore the arm, hands and fingers to their normal powers and functions**.

CASE I.—MISS ———, shot in her head, suffered **hemiplegia**, from which she had mainly recovered, except her **fore-arm, hand and fingers**, which remained **morbidly flexed**. By the use of this apparatus, and other

FIG. 26.



EXTENSOR
APPARATUS.

expedients, she has recovered the extensor powers of her hand, and is **now in the use of it as a telegrapher.**

CASE II.—E. CLEGHORN, with **resection of entire humerus** suffered **injury of ulnar and median nerves.** With the aid of apparatus to his arm for the resection, and apparatus to aid and restore extension of hand and fingers, he has recovered a **nearly normal use** of his hand and arm.

“WRIST DROP” FROM LEAD POISONING.

(*Extract from “Transactions of the American Medical Association,” 1869.*)

“THREE CASES OF LEAD PALSY FROM USE OF A COSMETIC CALLED ‘LAIRD’S BLOOM OF YOUTH.’” — BY PROF. LEWIS A. SAYRE.

“Of the value of Dr. Hudson’s apparatus in cases of this kind I cannot speak in too high terms. It is very **light and beautiful**, is **worn without any inconvenience**, enables the patient to exercise the hands and

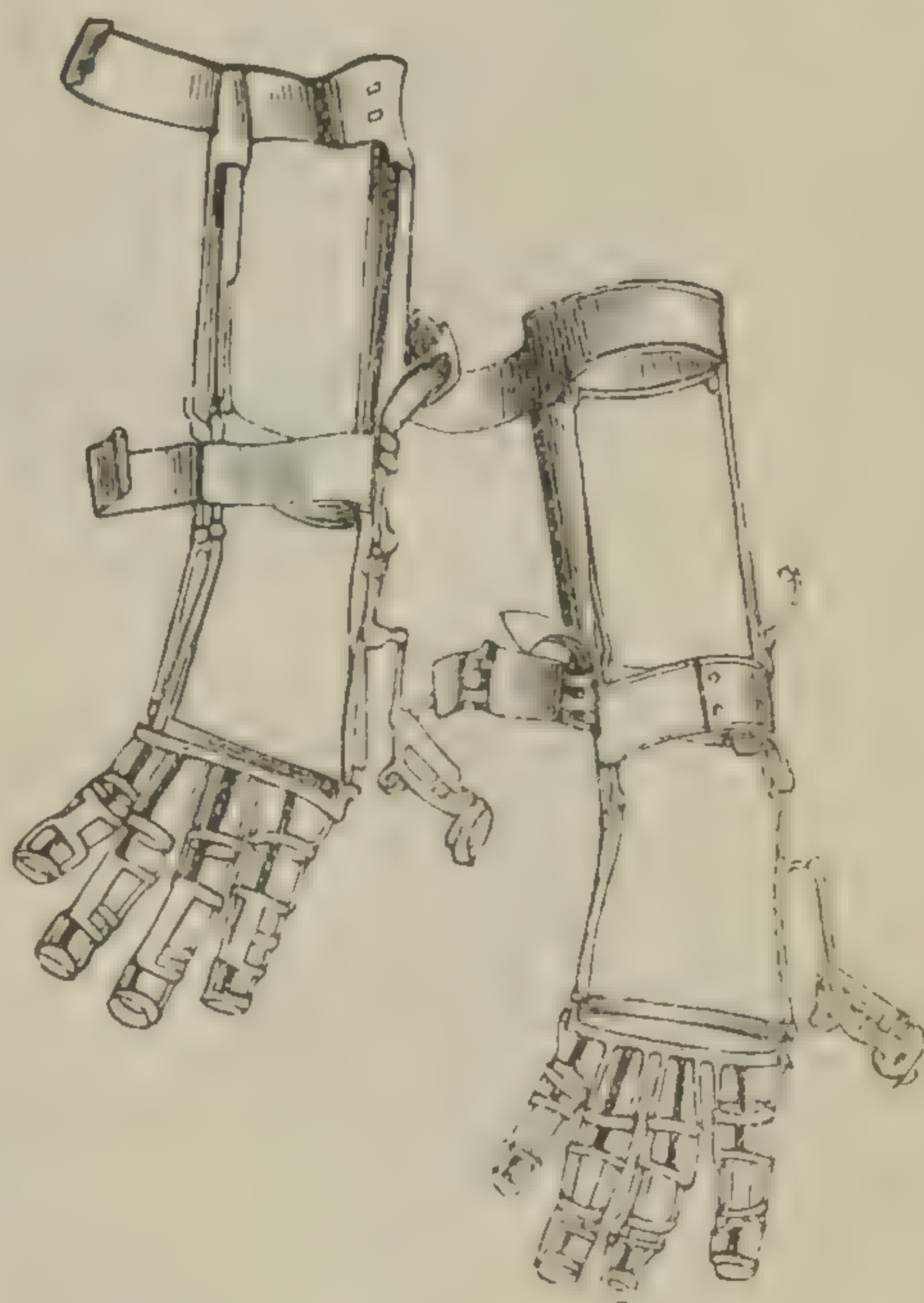


FIG. 27.

and fingers constantly, and thus materially **facilitates nutrition and development.**

“The annexed cuts (*See figs. 27, 28 and 29,*) give a very good idea of its construction, but to have it neatly made I would advise the patient to employ Dr. Hudson in person, corner of Fourth Street and Broadway, New York City. The cuts are from photographs by Mr. Mason, photo-



FIG. 28.

grapher to Bellevue Hospital, and give an accurate representation

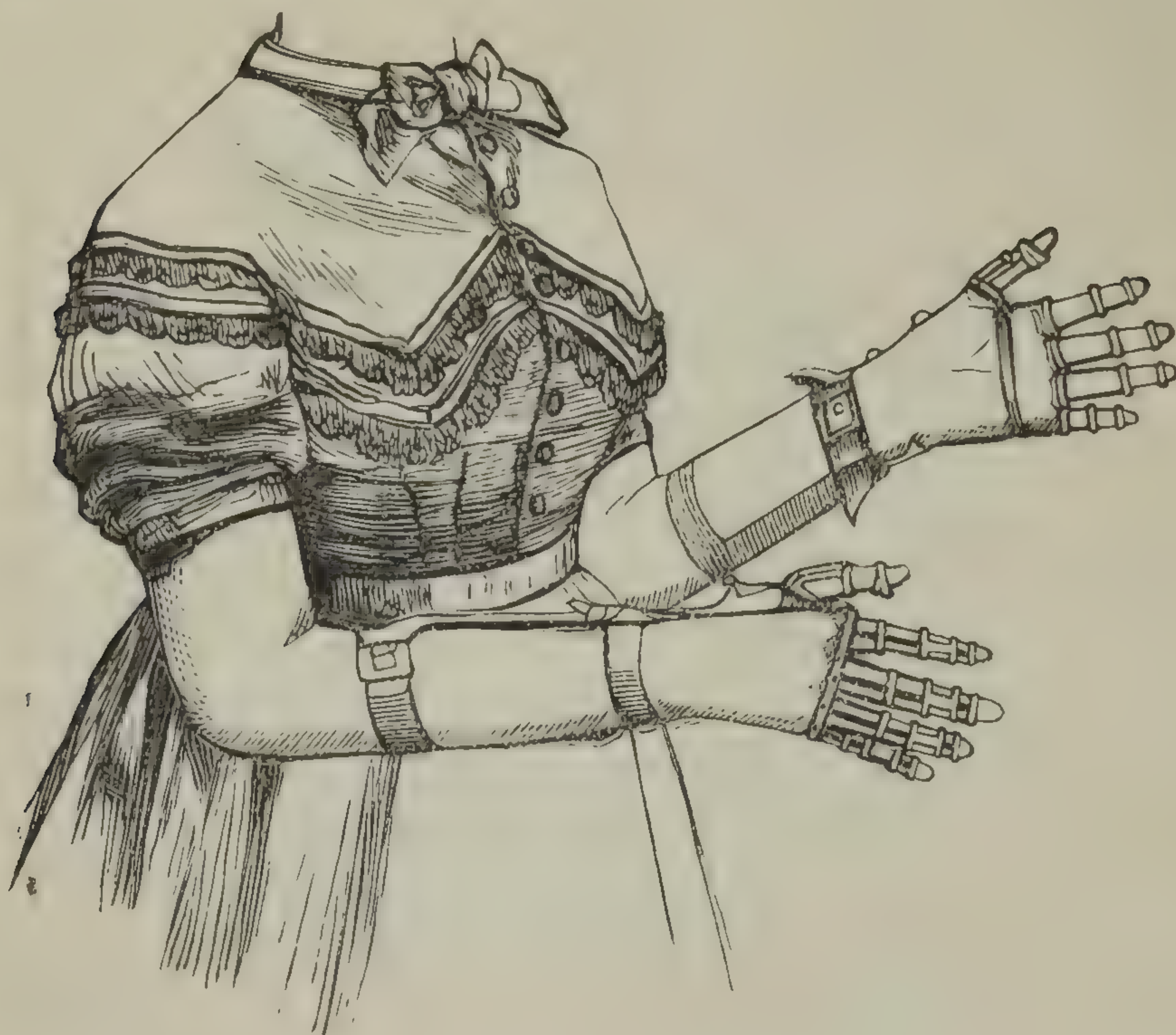


FIG. 29.

of the positions of the hands without the instrument, of the action of the instrument, and, also, of the instrument itself. ”

ARTIFICIAL HANDS AND ARMS

FOR AMPUTATIONS AND CONGENITAL DEFECTS.

The artificial hand and arm are new and successful representations of the natural ones ; every joint and the contour of the fingers, wrist, and elbow being retained in their construction. They possess



FIG. 30.

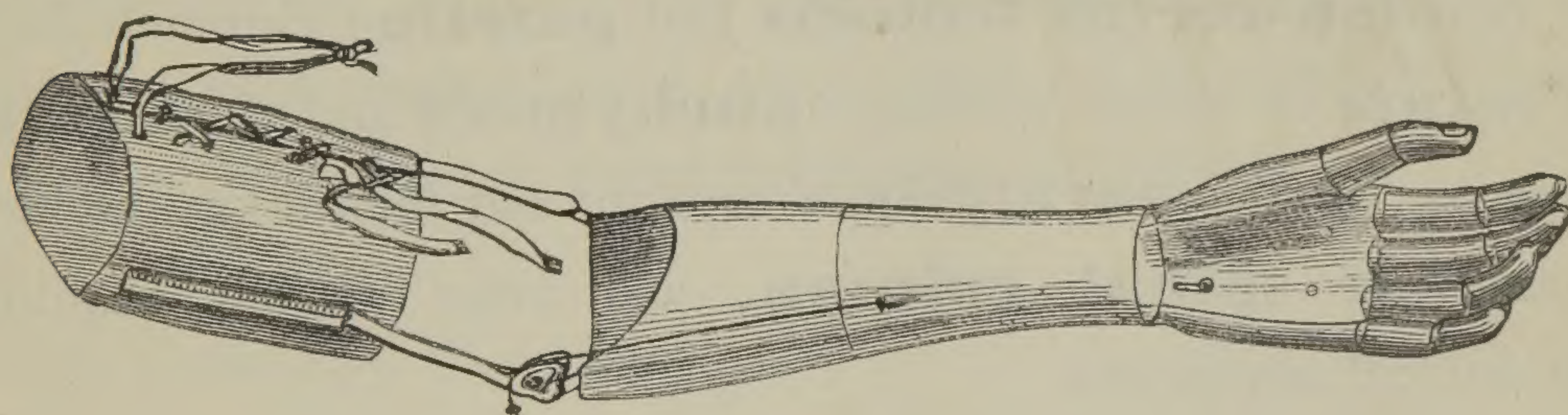
the functions of flexion and extension, for grasping and holding, and for every service which can be expected in an artificial hand and arm. The many who have availed themselves of this beautiful and valuable device are well pleased with it, not only

for its perfect imitation of the natural hand in dress, but for its efficient service, especially in an amputation of the fore-arm. **Plaster Paris casts of the unamputated hand and arm, and of the stump**, are essential for governing the size and symmetry in the construction of the artificial ones. A very beautiful and serviceable hand is made for congenital malformations of hands and arms. A less expensive hand and arm with implements for heavy service is often furnished workingmen.

HONORARY TESTIMONIAL TO THEIR MERIT.

I have never presented these arms for United States patronage. Their delicate mechanism and artistic finish render it impossible to furnish them at Government prices.

FIG. 31.



HAND AND FORE-ARM.

My desire to supply apparatus of first-class workmanship and greatest utility only, and my conviction of the secondary usefulness of even the best artificial arms, debarred me from the construction of an inferior article. Such, however, are made by others, and are of some practical utility. To the Board of United States Surgeons, convened in New York in 1864, in connection with other surgical apparatus presented for adoption by the Government, and for which I received commissions, I exhibited the artificial hand and arm as a scientific, ingenious, and artistic piece of mechanism, and to illustrate my interest in every department of mechanical surgery, and my ability to treat every form of mutilation in this as well as in its many other branches with perfected apparatus. It was carefully studied and admired, and received honorary mention in the Report of the Board to the Surgeon-General, as being a work of art for lightness, grace of action, naturalness of dress and utility, superior to all others.

MECHANICAL SURGERY

FOR THE UNITED STATES ARMY AND NAVY ;—**Officers, Soldiers and Seamen** ;—E. D. Hudson, M. D. :—

By the **authority** of the United States, **Maj.-Gen'l Joseph K. Barnes, Surgeon-General, U. S. Army**, comprising the **compensation** of every form of **amputation**, and all operations of **resection; ununited fractures**, and **shortening of limbs**; fractures of the **patella**, and ruptures of **tendon-rectus femoris** and **patella**; chronic disease of **joints** to relieve pressure ; **anchylosed** and **deformed limbs** ; partial **paralysis** of superior and inferior extremities ; injuries of **spinal column**, and other lesions requiring mechanical appliances.

By **Acts** of the **Congress of the United States**, approved June 17th and June 30th, 1870, every **officer** not above the **rank of Captain** in the army, and **Lieutenant** in the navy, and every **soldier** and **seaman** who was **disabled**, while in the **United States service** in the late war, was, and is made **entitled to receive a new limb; or apparatus** for **resections**, or other **mechanical appliance** for **lesion** of his limbs or other parts of his body ;—or, instead of the limb, apparatus and appliance, he may receive the **money value thereof as he may elect**. And **furthermore** he is entitled to have **new limbs, or apparatus, or their money value repeated** to him **every five years**. Each officer, soldier or seaman who receives an order for a limb, or an apparatus, receives also **transportation to and from the place** he may elect, where his limb or apparatus **shall be furnished** to him.

Forms and instructions, which have been prepared by the Surgeon-General, U. S. A., are furnished to any officer, soldier or seaman, (who may apply to Dr. E. D. Hudson, 696 Broadway,) **which any soldier or seaman can fill**, with his **application** for a limb or apparatus, or have some friend to avoid any expense. The same form serves those who wish to receive the money value of a limb or apparatus.

The **most approved** and **satisfactory** artificial limbs, and studied **apparatus** to fulfill physiological indications, are **constructed** and **adapted** under the **constant supervision** of Dr. E. D. Hudson, by the **commission** of the **Surgeon-General**, U. S. Army; which has been **continued** to him since the **first commission of 1862**.

NEW YORK, 696 Broadway,

April, 1871.

